

Inclusive growth and sustainable finance in connected national economies

*Klaus Arto, Joachim Block, Bo Hu¹, Armin Leopold, Stefan Pickl
Universität der Bundeswehr München, Germany*

Abstract

We discuss the impact of economic connectedness upon the policies of sustainable finance in a two-country model which is based on a previous paper, where we analyzed the relationship between economic growth and consumer debt from a financial and distribution-political perspective. According to our previous single-country model we found that a rebalancing policy through achieving more income equality would be a good choice. Our latest simulations, however, show that this strategy may be undermined by free international trade. The higher the degree of free movement of goods, the more likely the two countries will, as in a Prisoners' Dilemma, choose the policy of austerity – the worse option.

Keywords: inclusive growth, indebtedness, free movement of goods, two-country model, Prisoners' Dilemma

1. Introduction

In a previous paper (Block 2013) we investigated how indebtedness in a national economy is related to income inequality, foreign trade balance, and economic growth. The findings from our system dynamics model and the simulations of different policies are:

1. A high (not necessarily a shock of) income inequality leads to increasing consumer debt.
2. A high foreign trade deficit leads to increasing consumer debt, as well. A national economy with low competitiveness has to establish a high equality of income since it is exposed to a high risk of indebtedness.
3. Compared to austerity, achieving more income equality seems to be a better method to limit and reduce debt while enhancing economic growth.
4. Inclusive growth is a prerequisite for sustainable finance.

Essential economic and financial figures of eight national economies in the euro zone seem to support at least the findings 1) and 2). Between 2001 and 2011, some of these countries (first row in Figure 1) achieved both a significant current account surplus (magenta bars) and a relatively low income inequality (measured using income quintile share ratio, denoted "S80:S20" in Figure 1, light blue curves). In these countries the debt reduction (green curves) is correlated relatively closely to the growth of gross domestic product (GDP, red curves).

¹ Corresponding author. E-mail address: bo.hu@unibw.de

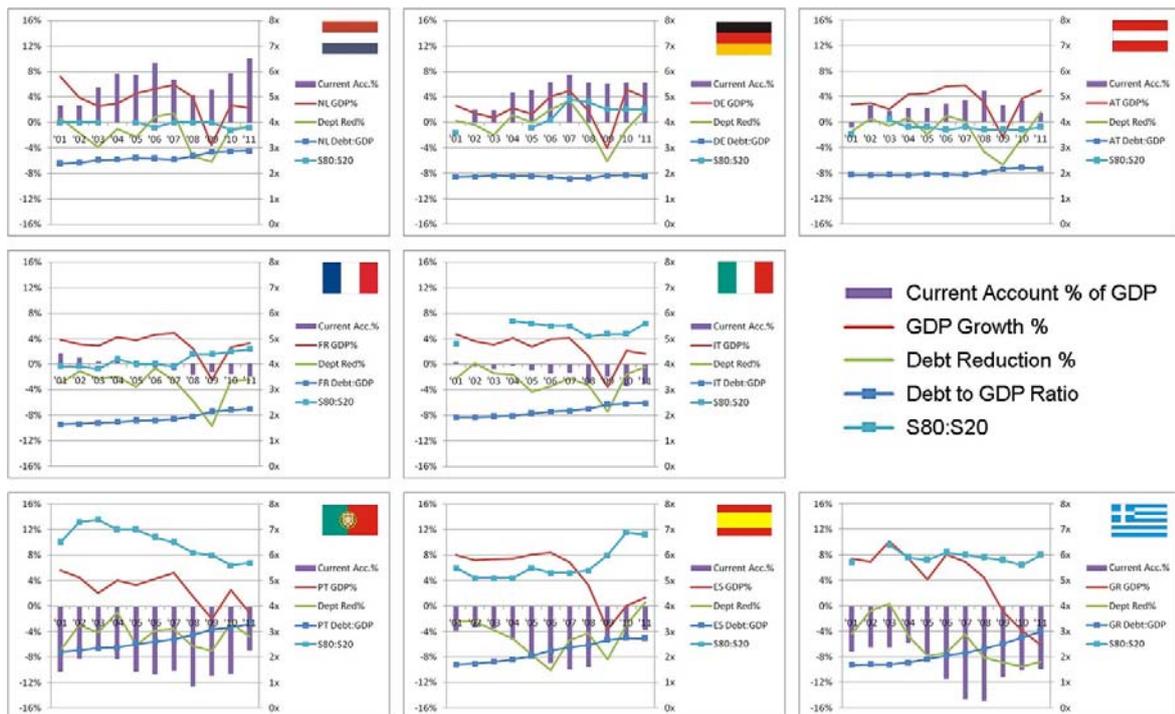


Figure 1: Essential economic and financial figures of selected countries in the euro zone 2001-2011 (data source: eurostat 2013)

Both the model simulations as well as the statistic figures seem to speak a clear language. However, since both foreign trade deficit and income inequality lead to increasing consumer debt, following questions are raised from a national economy point of view: How is the impact of economic connectivity upon the necessity and feasibility of a national policy combating indebtedness? Furthermore, is a wait-and-see policy an option in a competitive environment? Lastly, is achieving more income equality still a better choice in an environment like the euro zone in which the free movement of capital, goods, services and (working) people belong to the founding principles?

In this paper we will address these questions and extend our existing single-country model to the case of two connected national economies. In the following we provide at first some background information from our literature research in Section 2. Section 3 presents our system dynamics model using both causal loop and stock-and-flow diagrams. In contrast to widely used dynamic stochastic general equilibrium (DSGE) models, system dynamics helps to set the focus on the system-immanent feedback structures. Through different simulation runs in Section 4 we investigate how individual debt reduction policies of two countries impact the entire system, i.e. GDP and debts of both countries.

2. Background

The financial crisis which started in 2007/2008 seems to be overcome to a great extent. The International Monetary Fund (IMF) project a significant increase in global growth for the years 2014 and 2015 (IMF 2014). Global growth is assumed to rise from 3% in 2013 to 3.7% in 2014 and to 3.9% in 2015. Although global growth is mostly driven by emerging markets, among

others China and India, the “euro area is turning the corner from recession to recovery” (IMF 2014, p.1).

The recovery of the world economy is based mainly on two aspects: On the one hand, there are low interest rates offered by central banks pushing demand. Symptomatically, interest rates in the US and the European Union (EU) have reached historical lows. The Federal Reserve System (FED) has reduced the federal funds rate for the United States from 5% in 2008 to 0.25% in 2014 (global-rates.com 2014). The interest rates of the European Central Bank (ECB) followed a similar pattern. From 4% in 2008, they have reached a level of 0.25% in 2014 (eurostat 2013).

On the other hand, trade significantly contributes to global growth. Especially for countries under debt pressure trade is important. High levels of public and private debt influence domestic demand negatively. In countries like Spain or Greece trade is the only realistic option for growth.

Although the world economy is on the rise, we should be very cautious about declaring the financial crisis of 2007/2008 as past. Many developed and emergent countries still face critical debt levels. In mid-2013, the estimate size of the global debt and securities market has reached incredible \$100 trillion, with nearly 50% being debts of general governments (Drehmann 2014). Particularly, the widespread debts endanger the stability of the worldwide economic system. No wonder that debt reduction is on the political agenda of most countries. This seems an inevitable step for sustainable economic growth. However, the key mechanism of Central Reserve Banks to influence public and private demand, i.e. adjustment of key interest rates, is nearly dissipated. Policy makers are forced to identify other ways to bring the debt problem to a solution.

As lately seen not only with Greece, austerity measures are often first choice actions to counter indebtedness. Although austerity indeed reduces debt levels, some dramatic problems appear when applying such a policy as well. Austerity measures have a natural lower boundary, because austerity influences a nation’s welfare at its core. If austerity falls below a certain level, the risk of social unrest and political instability evolves (Ponticelli 2011). Besides austerity, there are two additional ways to counter indebtedness. Affecting the distribution of income as well as increasing trade are possible policies for governments to increase national income and to decrease debt levels subsequently. By adjusting the income distribution, governments try to enforce local demand. By applying a so called strategic trade policy, governments want “to shift excess returns from foreign to domestic firms” (Krugman 1987, p. 134). Such policies are aimed to support national industry in international competition at the expense of other countries. Although strategic trade policies are contrary to the classical free trade model (Krugman 1987), for some countries these policies seem to be the only realistic possibility for growth and to counter rising debt levels.

No matter what policy a nation pursues to reduce debts and to push growth, it definitely will have impact on other nations. Like decades before, advancing globalization is still a key driver for global economic integration (World Trade Organization 2013). Modern technology, especially in the fields of communication and transportation, results in more and more international supply chains. Goods and services are procured not only from one but from many different countries. National economies compete and depend on each other at the same time (Bridgman 2010). In addition, free-trade agreements between countries or groups of countries contribute to further integration. The Transatlantic Trade and Investment Partnership (TTIP) between the European Union and the US (European Commission 2013, the regulatory part), which actually is in progress, is only one example for this development.

According to (Chang 2013), the root of the European debt crisis lies in financialization and uneven income distribution. Based on the development of financialization, two kinds of capitalism models can be distinguished. For one there are countries like Greece, Ireland or the USA which follow a so called debt-led consumption model. These countries try to influence national consumption by appropriate policies. As a result, they suffer from a current account deficit. To the others there are countries like Germany, Japan and China following a so called export-led mercantilist model with a current account surplus. Both models are tightly connected and complementary to each other. Export-led mercantilist countries depend on the public and private consumption of the debt-led consumption countries. If debt-led consumption countries reduce their debt levels by a strict austerity policy, this will inevitably have impact on the export-led mercantilist countries. “The austerity policy which is adopted by neoclassical economic theory, cannot solve government debt problems and further worsens the economy” (Chang 2013, p. 47).

The tight connection between economies and the impact of national policies on the world economy can be seen in the ongoing discussion about Germany’s export-led policy. The export surplus of Germany, i.e. the difference between exports and imports, reaches a new all time high with now being the highest in the world. With a value of \$260 billion for 2013 (DeSTATIS 2014) it is considerable higher than that of the number two in the world: China with \$195 billion. While many countries were severely hurt by the financial crisis starting in 2007/2008, Germany’s economy passed the crisis with only minor problems. In contrast to other countries in the EU area, Germany has maintained a large current account surplus throughout the crisis. However, this surplus has been to the expense of other countries: “Germany’s anemic pace of domestic demand growth and dependence on exports have hampered rebalancing at a time when many other euro-area countries have been under severe pressure to curb demand and compress imports in order to promote adjustment. The net result has been a deflationary bias for the euro area, as well as for the world economy” (U.S. Department of the Treasury 2013, p. 3). There are some fears that Germany’s export-oriented policies could endanger not only the euro area but also the global economy. According to the European Commission, Germany is “experiencing macroeconomic imbalances, which require monitoring and policy action” (European Commission 2014, p. 6). Given the size of Germany’s economy, actions are necessary “to reduce the risk of adverse effects on the functioning of the domestic economy and of the economic and monetary union” (European Commission 2014, p. 6).

The question arises, if cooperation and policy coordination between countries are necessary steps to advance the world economy into the desired direction. To find an answer, Cripps et al. simulated different scenarios using the Cambridge-Alphametrics Model (Cripps 2011). This model uses a decomposition of the world into nine blocs: USA, Europe, China, India, Latin America, Africa, Asia low income countries, resource-rich middle income countries, and other high income countries. The decomposition reflects the preconditions on “under-consumption” in some parts of the world and on “over-borrowing” in other regions. They share the opinion “that cooperation and policy coordination are an imperative as much for the US [...] as for India and China” (Cripps 2011, p. 2). As a result, the coordinated implementation of demand and structural policies could reduce global inequality without the need for reducing growth in high-income countries. Without coordinating individual policies global imbalance will continue to increase and global welfare is in danger.

Understanding the interactive mechanisms between connected national economies and identifying national and international policies which contribute to inclusive growth and

sustainable finance for all countries, this seems to be not only a research task, but a real challenge especially to the national economies in the euro zone.

3. A system dynamics model of two connected national economies

In our previous paper (Block 2013) we deliberately focused on a single country. Hence, the foreign trade balance is modeled as an exogenous variable to the underlying system dynamics model. However, as the trade balance being an important driver for economic growth it is essential to understand the mechanisms which influence this parameter. In this section we extend our previous single-country model to a two-country model to have a closer look at the impact of economic connections between two countries upon the outcome of the economic policy of each country.

3.1 A causal loop diagram

Before introducing the stock and flow diagram we start with a simple causal loop diagram (Figure 2) showing the essential relationship between economic growth, debt development and other factors of a single national economy. Notice that debt 1 is part of three different feedback loops. The highlighted reinforcement loop shows that a possible way to accelerate economic growth is to couple increasing GDP 1 with increasing non-investor income 1. Increasing non-investor consumption 1 without increasing non-investor income 1, as shown by the balancing loop on the right side, leads to increasing debt 1 which in turn limits the growth in the long run. The parameter labor share 1 plays an important role here. Increasing labor share seems to be a better option to achieve rebalancing according to our single-country model presented in (Block 2013), compared to the policy of austerity which reduces non-investor consumption 1 and is expressed by the highlighted balancing loop in the middle of Figure 2.

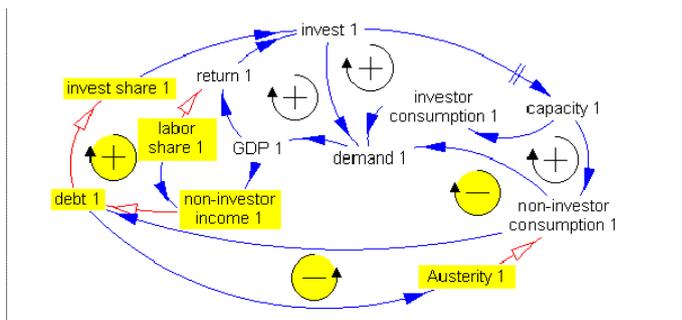


Figure 2: A causal loop diagram for growth and debt (based on Block 2013)

To depict the situation of two connected national economies we duplicate the structure in Figure 2 and connect the two blocks via two elements: net remittance 1 and net export 1 (Figure 3). As highlighted on the left side of Figure 3, the effect of migration and remittance (Ratha 2009, eurostat 2010) balances the income situations of both countries and trends to reduce a possible difference.

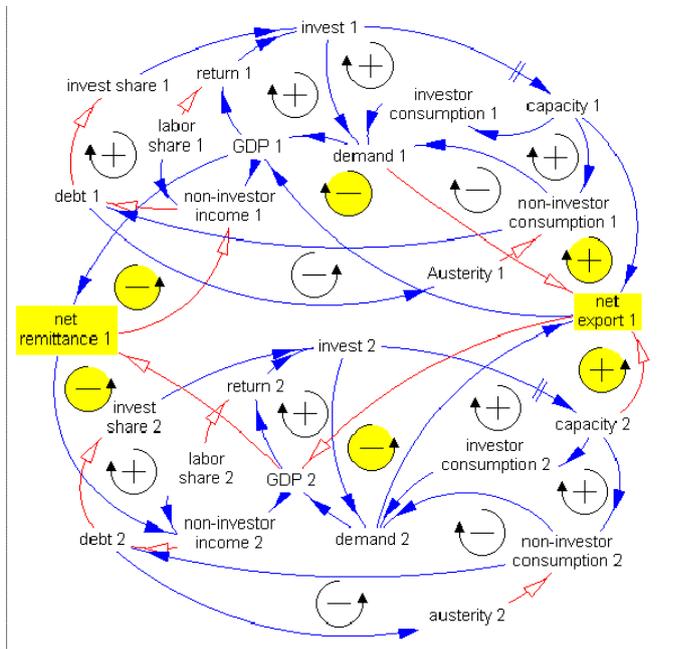


Figure 3: A causal loop diagram of two connected national economies

On the right side, net export 1 is involved in two balancing and two reinforcement loops. Notice that GDP 1, return 1 and invest 1 (respectively their counterparts in the second block) are also parts of the loops, while demand 1 and capacity 1 belong to different loops. This constellation seems to open a new perspective to rebalance a national economy: An austerity policy needs not to lead to decreasing GDP 1 anymore, since net export 1 may compensate or even over-compensate the reduction.

Notice that net export 1 is a summand for GDP 1 and the subtrahend for GDP 2. It becomes apparently, at the latest at this point, that the economic connectedness between both countries matters and which action the other country takes matters, too. Based on this causal loop diagram we are going to introduce the stock and flow model.

3.2 A stock and flow diagram

In this section we present a stock-and-flow model of two connected national economies. We start with our previous model focusing on relations and driving forces between gross domestic product (GDP), consumer debt (including the public debt) and income inequality in a single national economy (Block 2013). As shown in Figure 4, non-investor money 1, capacity 1 and consumer debt 1 are implemented as stocks. One summand of GDP 1, (domestic) demand 1, is defined as the sum of invest 1, investor consumption 1 and non-investor consumption 1.

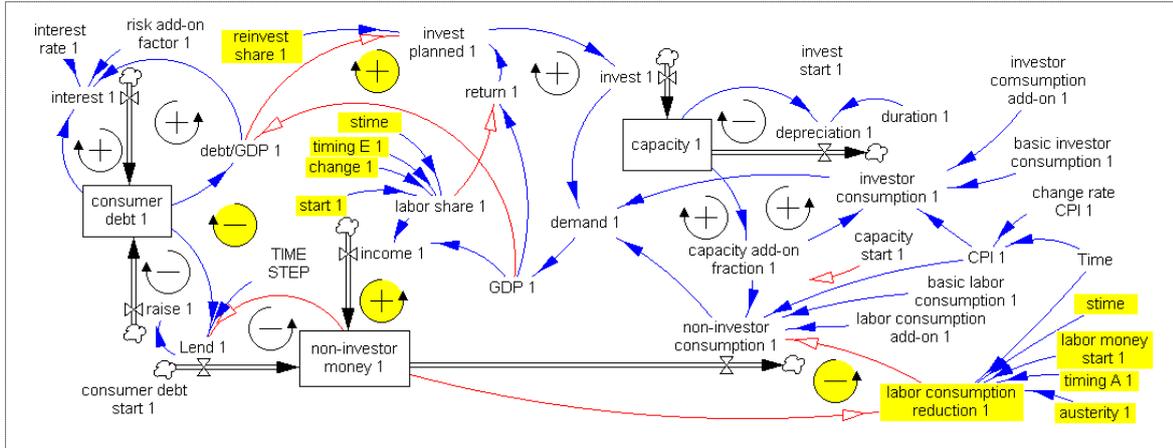


Figure 4: A single country model of growth and debt (based on Block 2013, slightly modified)

As expected, *austerity 1*, *invest share 1* and *labor share 1* in the causal loop diagram shown in Figure 2 in Section 3.1 are supplemented or replaced by other elements to reflect the numeric details. A fourth, additional feedback loop, as a comment positioned near the element *non-investor money 1* in Figure 4, can be considered as a meaningful regulation of a possible austerity policy which should come only into action when the non-investors run out of money.

Similar to Section 3.1 we duplicate the structure shown in Figure 4 to depict two national economies. The upper and lower blocks are connected by *net remittance 1* and *net export 1*, as shown in Figure 5. For characterization of loosely or tightly coupled national economies degree of free movement of people and degree of free movement of goods are introduced as simulation parameters. The GDP of a country has now a second summand and is expressed as:

$$Y_i = D_i + X_i = D_i + \lambda \left(\frac{D_j C_i - D_i C_j}{C_i + C_j} \right) \quad (1)$$

where

$$i, j \in \{1, 2\} \wedge i \neq j$$

Y_i : GDP (BEuro/Year)

D_i : demand (BEuro/Year)

X_i : net export (BEuro/Year)

$\lambda \in [0, 1]$: degree of free movement of goods

C_i : capacity (BEuro)

Notice that no trade takes place between both countries if degree of free movement of goods or $\lambda = 0$. And if $\lambda = 1$, the demands of both countries are distributed proportionally to capacities of both countries.

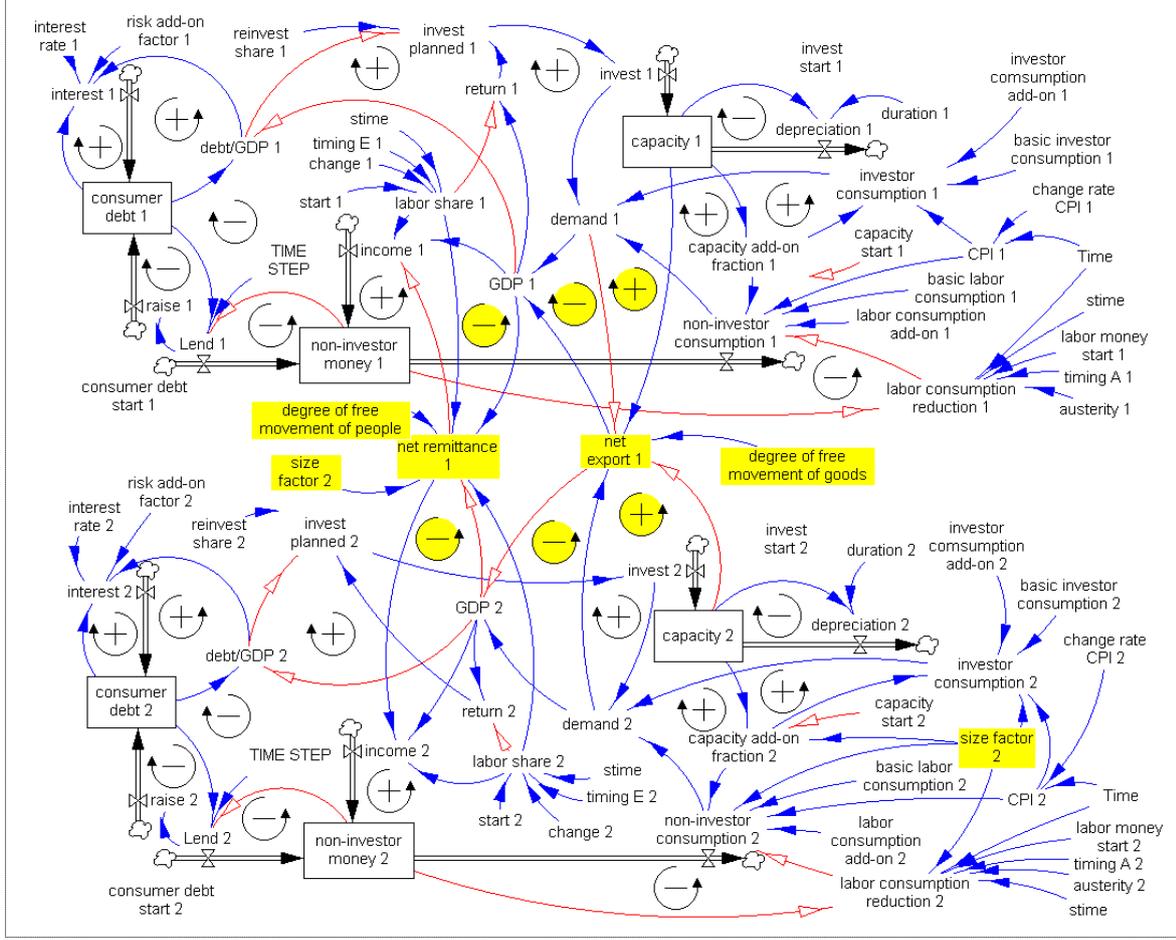


Figure 5: Connecting both countries through free movement of goods and (working) people

A further simulation parameter size factor 2 is introduced to cover the situations that two national economies of different sizes are connected to each other. Regarding remittance of working migrants we have:

$$I_1 = \phi_1 Y_1 - R_1 = \phi_1 Y_1 \left(1 - \mu \frac{\sigma_2 \phi_1 Y_1 - \phi_2 Y_2}{\sigma_2 \phi_1 Y_1 + \phi_2 Y_2} \right) \quad (2)$$

$$I_2 = \phi_2 Y_2 + R_1 \quad (3)$$

where

$$i, j \in \{1, 2\}$$

I_i : income (BEuro/Year)

$\phi_i \in [0, 1]$: labor share

Y_i : GDP (BEuro/Year)

R_1 : net remittance 1 (BEuro/Year)

$\mu \in [0, 1]$: degree of free movement of people

σ_2 : size factor 2

Using the system dynamics model depicted in Figure 5 we are able to conduct simulations using different values of degree of free movement of goods or λ in (1) and degree of free movement of people or μ in (2) to analyze the impact of these parameters upon the outcomes of the actions that both countries take towards a sustainable finance.

4. Simulation results and discussions

In this section we use the system dynamics model described in Section 3 to address the questions raised in Section 1.

In all following groups of simulation runs we assume that both countries start at a labor share of 50% and with no austerity policy applied. At least one of the two countries starts its action to counter indebtedness in the 7th year. The parameters of such an action are chosen so that a country would be able to reduce its debt to 0 in the 30th year in the case that there were no economic connections to the other country. Compared to GDP 1 and net export 1, in all cases the value of net remittance 1 is rather small (see, e.g., eurostat 2014, Figure 2). For sake of simplicity we set the degree of free movement of people to 0 for all our simulation runs. All consumer debt and GDP values are in BEuro and BEuro/Year, respectively.

4.1 No action is not an alternative

First of all, there is no doubt that it is inevitable to take actions to limit the consumer debt. As discussed in Section 3.2, an increasing consumer debt to GDP ratio leads finally to decreasing investment and to economic down turn. In the long run the policy of reduction of income inequality outperforms the policy of “no action” even regarding the economic growth, as shown in Figure 6 where GDP 1 and consumer debt 1 are related to the country switching to the policy of reduction of income inequality in the 7th year while GDP 2 and consumer debt 2 are related to the other country doing nothing.

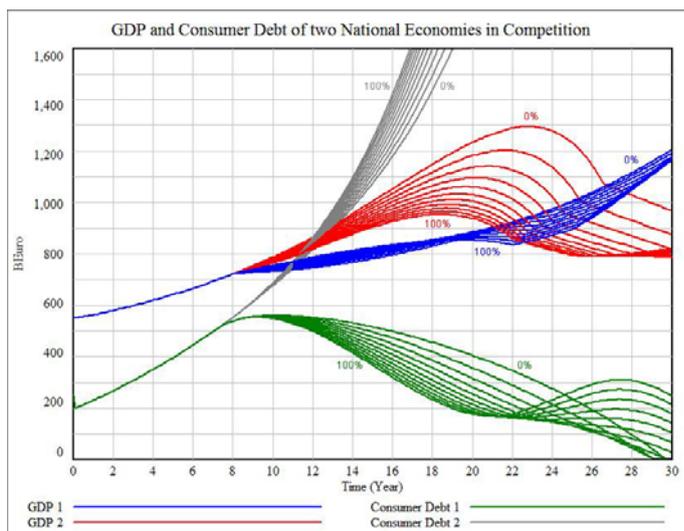


Figure 6: Equality vs. no action. The numbers near the curves indicate the degree of free movement of goods.

As also shown in Figure 6, the higher the degree of free movement of goods, the stronger is the growth of its consumer debt in the country doing nothing, due to a higher foreign trade deficit.

If one country chooses the policy of austerity the situation for the other country doing nothing is even worse. As shown in Figure 7, country 1 seems to be able to export the debt to country 2 literally while having only a short period of time of economic stagnation itself. In an extreme case that the degree of free movement of goods is 100%, country 1 outperforms country 2 from the moment of switching to austerity in economic growth while having a lower consumer debt all the time than country 2.

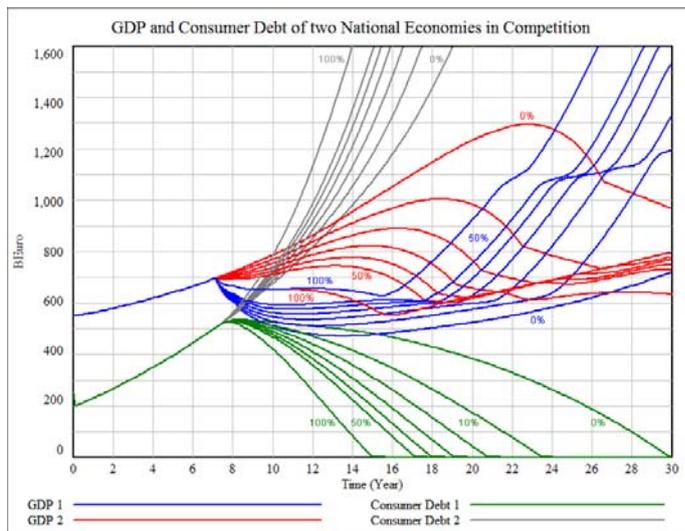


Figure 7: Austerity vs. no action. The numbers near the curves indicate the degree of free movement of goods.

No action is not an alternative, regardless which degree of free movement of goods there is and which action the other country takes. And it is hardly necessary to show that even delays in adopting one of the policies may cause a significant disadvantage in a comparison between both countries.

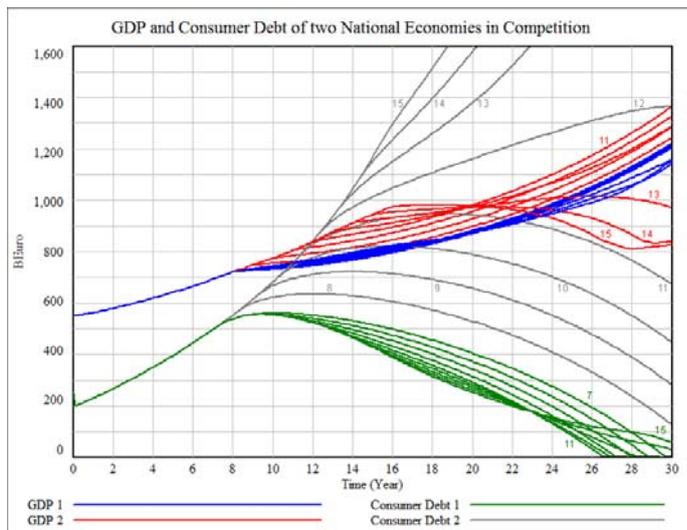


Figure 8: A delayed equality policy does not provide an acceptable solution. The numbers near the curves indicate the year of the beginning of the equality policy in the country 2.

Figure 8 shows the development of GDP and consumer debt in both countries in dependence of the year in which the second country starts its action. A tight connection (degree of free movement of goods = 50%) with another country pursuing equality policy shortens the time a country has to take action before it may be sucked under by a debt crisis.

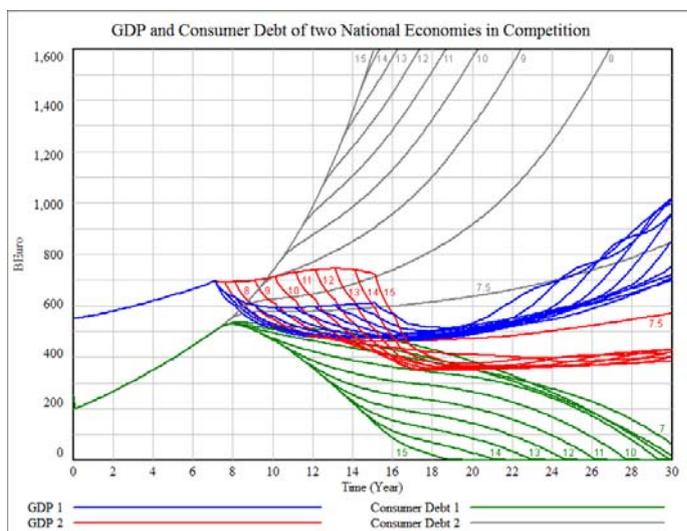


Figure 9: A delayed austerity policy does not provide an acceptable solution. The numbers near the curves indicate the year of the beginning of the austerity policy in the country 2.

Coming to the austerity policy, we obtain an even tougher picture. As shown in Figure 9, once the first country has started its austerity policy, the second country which is economic connected tightly (degree of free movement of goods = 50%) to the first one has almost no more chance to get its own debt under control.

4.2 Equality vs. austerity - a Prisoners' Dilemma

Now we take a look at another constellation. Both countries start to take action to reduce their consumer debt in the 7th year, however, in different ways. Country 1 pursues the equality policy, country 2 the austerity. Figure 10 shows the simulated development of GDP and consumer debt of both countries, again in dependence of the degree of free movement of goods. Obviously, the country pursuing austerity outperforms, and, perhaps, outsmarts the other country already at a relatively low degree of free movement of goods.

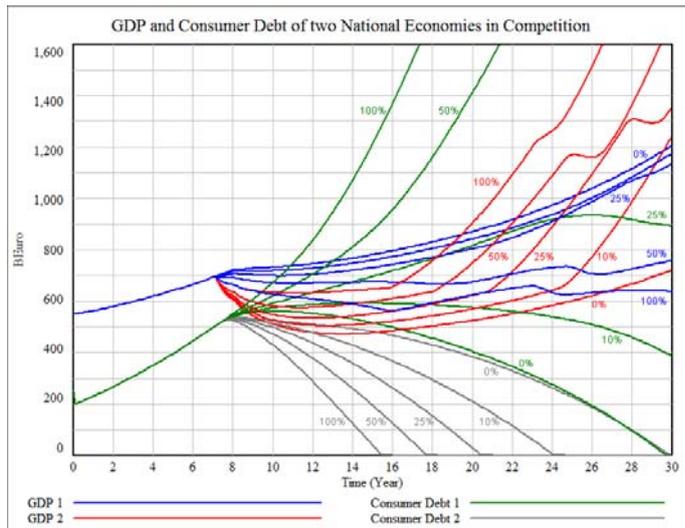


Figure 10: Equality vs. austerity. The numbers near the curves indicate the degree of free movement of goods.

The values of GDP and consumer debt in the 30th year can be put into an outcome matrix. Table 1 is the outcome matrix at a degree of free movement of goods of 10% and table 2 shows the outcomes at the degree of 50%. The outcome of each combination of actions by both countries is given by (GDP 1, debt 1), (GDP 2, debt 2) in the 30th year. Both matrices are symmetric.

Table 1: Outcome matrix at the degree of free movement of goods of 10%

(GDP 1, debt 1), (GDP 2, debt 2)		country 2	
		equality	austerity
country 1	equality	(1205 , 0), (1205, 0)	(1175, 387), (1355, 0)
	austerity	(1241 , 0), (1175, 387)	(722, 0), (722, 0)

Table 2: Outcome matrix at the degree of free movement of goods of 50%

(GDP 1, debt 1), (GDP 2, debt 2)		country 2	
		equality	austerity
country 1	equality	(1205 , 0), (1205, 0)	(757, 3762), (1702, 0)
	austerity	(1702 , 0), (757, 3762)	(722, 0), (722, 0)

Obviously we have following preference relations regarding GDP and consumer debt for a single country:

$$(1241, 0) > (1205, 0) > (722, 0) \quad (4a)$$

and

$$(1702, 0) > (1205, 0) > (722, 0) \quad (5a)$$

Notice that these outcomes are three of the four possible ones in both outcome matrices above for each of both countries. Now if we assume that each country cares only about its own outcome and that

$$(722, 0) > (1175, 387) \quad (4b)$$

and

$$(722, 0) > (757, 3762) \quad (5b)$$

then we will have two outcome matrices describing each a well-known (non-iterative) Prisoners' Dilemma (see, e.g., Guyer 1972, Brosig 2002, Kuhn 2009) "in which self-interested action seems to lead inexorably to a Pareto inferior outcome" (Lipman 1986) which is the austerity policy in both countries.

Without having detailed knowledge about the preference functions of both countries, i.e., how both countries weigh the GDP against the debt, it can be said that (5b) is much more likely true than (4b).

At a degree of free movement of goods of 10%, there may be a chance that country 2 decides for the policy of equality because of the higher GDP and the moderate debt level, assuming country 1 decides for the policy of austerity (see Table 1). At a degree of free movement of goods of 50%, in contrast, no matter which choice country 1 makes, country 2 will always choose austerity, in the one case for the higher GDP, in the other case against the exorbitant high value of debt (see Table 2).

In other words, it is much more likely that both countries face a Prisoners' Dilemma at the degree of free movement of goods of 50% than at the degree of free movement of goods of 10%.

The higher the degree of free movement of goods, the more unlikely both countries will, as in a Prisoners' Dilemma, pursue the equality policy in their countries, as long as each of them does not really care about the outcomes for the other country. It becomes apparent that the free movement of capital, goods, services and people alone does not provide the optimal instruments to facilitate inclusive growth and sustainable finance.

4.3 An evidence for a “social union”

One possible way out of the Prisoners' Dilemma described in Section 4.2 is to redefine the preference functions of both countries so that they do care about the outcome of each other. As a matter of fact, different bailout programs in the euro zone do already show the movement in the direction of a so-called “debt union”. However, such bailout programs imply an enormous problem of moral hazard which is described contextually in (Wolf 1999) as “a disposition on the part of individuals or organizations to engage in riskier behavior, than they otherwise would, because of a tacit assumption that someone else will bear part or all of the costs and consequences if the incurred risk turns out badly”. In other words, if both countries in our model have to bailout each other, no action may become an alternative, in contrast to Section 4.1, so that none of both countries will start any action against indebtedness.

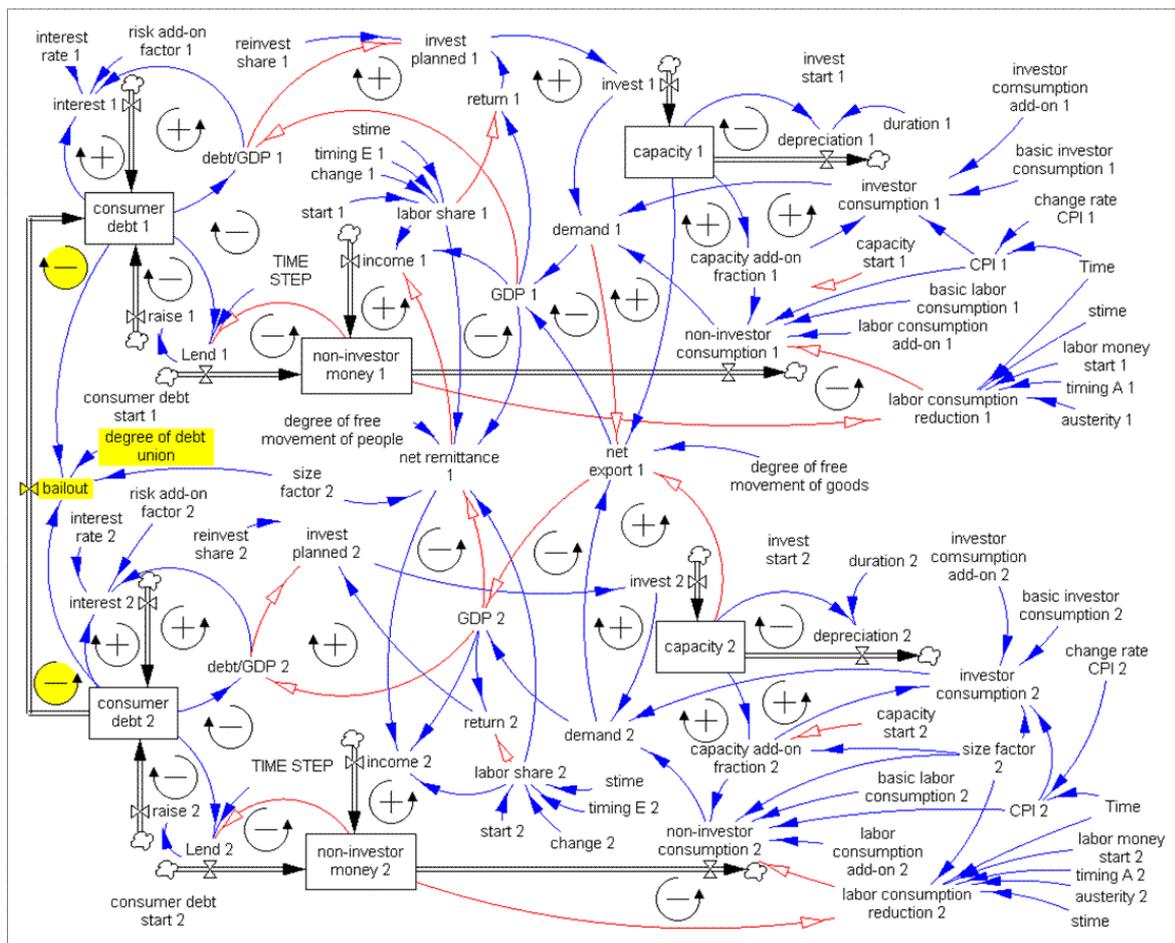


Figure 11: Modeling a “debt union”

Figure 11 shows a preliminary extension of our model to depict a “debt union”. As highlighted on the left side, a flow bailout which is controlled by a parameter degree of debt union balances the levels of consumer debt of both national economies under consideration. If degree of debt union = 0, no bailout takes place.

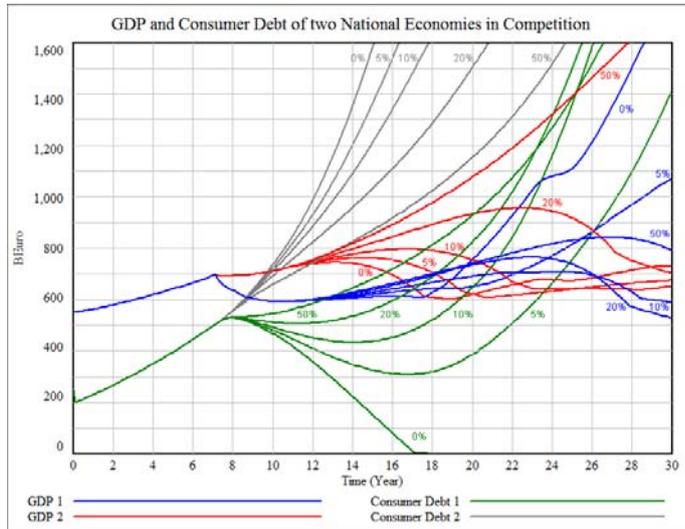


Figure 12: No action becomes an alternative within a “debt union”. The numbers near the curves indicate the degree of debt union. The degree of free movement of goods is set to 50%.

Our simulations confirm our fears. Already at a low level of degree of debt union of 5% the consumer debt of the country pursuing an austerity policy gets out of control (green curve in Figure 12). At the level of 20% the GDP of the country doing nothing (red curve) outperforms the one of the other country (blue curve). Expecting such a result in advance none of the countries will ever take any action to counter indebtedness.

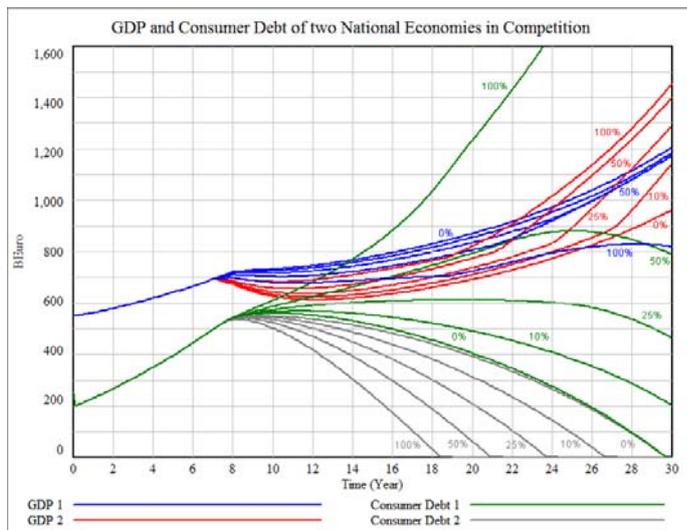


Figure 13: Equality vs. austerity within a “social union” prescribing labor share ≥ 0.6 . The numbers near the curves indicate the degree of free movement of goods.

Table 3: Outcomes (in the 30th year) of the move combination equality vs. austerity

degree of free movement of goods	10%	50%
without "social union"	(1175, 387), (1355, 0)	(757, 3762), (1702, 0)
with "social union"	(1184, 203), (1142, 0)	(1174, 789), (1398, 0)

Another way out of the crisis is to establish a “social union” which prescribes a common minimum labor share in both countries, for instance, at the level of 60%. Figure 13 shows our simulation results under such a condition. Compared to the development depicted in Figure 10, the disadvantage of the country pursuing equality policy caused by free movement of goods is reduced remarkably (Table 3).

5. Conclusions

Based on our previous single-country model analyzing the relationship between economic growth and consumer debt from a financial and distribution-political perspective, we have developed a two-country model to learn more about the impact of economic connectedness upon the policies of sustainable finance. Two structures, each of which represents a single national economy, are connected via elements which describe the effects of remittance and trade between both countries (Sections 3.1 and 3.2).

Our simulations show that economic connectedness trends to force a country facing the risk of indebtedness to take action and to do it timely. No action is not an alternative, regardless which action the other country takes. Within connected national economies a wait-and-see tactic leads to a worse result than in an isolated one (Section 4.1).

There are principally two policy options available: a rebalancing policy through achieving more income equality, and a policy of austerity. In our previous paper the first one was found to be the better choice. However, as shown by simulations using the new two-country model, the policy of

equality in one country may be undermined by an austerity policy pursued by the other country through free international trade. The higher the degree of free movement of goods, the more likely the two countries will, as in a Prisoners' Dilemma, choose the policy of austerity – the worse option (Section 4.2).

Establishing a “social union” which defines a minimum standard of income equality in both countries seems to be one possible way to break out of this Prisoners' Dilemma. In contrast the concept of a “debt union” will likely demotivate each of both countries to start its action to counter indebtedness, as shown by our preliminary simulations (Section 4.3).

Connected national economies constitute a highly complex system. This paper attempts to contribute to more insights into the mechanisms at work. In the next steps we intend to expand our model to a three-country model. It is proposed to use such a model or even an agent based approach to depict the connectedness between different national economies on a more realistic basis of available statistic data. Furthermore, we are also going to conduct iterative gaming experiments on our online system dynamics modeling and experimentation platform (Arto 2014) using the model presented in this paper.

References

- Arto 2014** Klaus Arto, Bo Hu, Armin Leopold, Silja Meyer-Nieberg, Goran Mihelcic, Jan Stutzki, Tim Tepel: Modellbasierende Früherkennung politischer Krisen: Prototyp einer serviceorientierten Plattform. *Multikonferenz der Wirtschaftsinformatik, Tagungsband*, 278-293, Paderborn, 26.-28.02.2014
- Block 2013** Joachim Block, Bo Hu and Stefan Pickl: Inclusive growth and sustainable finance - a system dynamics model. *The 2013 International Conference of the System Dynamics Society, Proceedings*, Cambridge, MA, USA, July 21 – July 25, 2013
- Bridgman 2010** Bridgman Benjamin: International supply chains and the volatility of trade. *Economic Inquiry, Volume 51 No. 4: 2110-2124*, 2013
- Brosig 2002** Jeannette Brosig: Identifying cooperative behavior: some experimental results in a prisoner's dilemma game. *Journal of Economic Behavior & Organization, Volume 47, Issue 3: 275-290*, March 2002
- Chang 2013** Chang Chia-Jen and Chung Chia-Jung: A Discussion on the European Debt Crisis by Fiscal Sociology. *International Journal of Research in Business and Social Science (IJRBS), Volume 2 No. 4: 37-48*, ISSN 2147-4478, 2013
- Cripps 2011** Cripps Francis, Izurieta Alex, and Singh Ajit: Global imbalances, under-consumption and over-borrowing: the state of the world economy and future policies. *Development and change, Volume 42 No. 1: 228-261*, 2011
- DeSTATIS 2014** Statistisches Bundesamt Deutschland: Foreign trade balance 2013. 6 March 2014, <https://www.destatis.de/EN/FactsFigures/NationalEconomyEnvironment/ForeignTrade/ForeignTradeIndicators/ForeignTradeBalanceExportImport.html>
- Drehmann 2014** Mathias Drehmann, Nikola Tarashev, Alan Villegas, Agne Subelyte: International banking and financial market development. *Borlo Claudio, Domanski Dietrich, Upper Christian, and Turner Philip (Eds.): BIS Quarterly Review, March 2014*, Bank for International Settlements (BIS), Basel, Switzerland, 2014
- European Commission 2013** European Commission (EC): Transatlantic Trade and Investment Partnership - The Regulatory Part. European Commission (EC), September 2013

- European Commission 2014** European Commission (EC): Commission concludes in-depth reviews of 17 Member States to check for macroeconomic imbalances. *MEMO, 14/158*, 5 March 2014
- eurostat 2010** Money sent by migrants to their country of origin fell by 7% in 2009. *eurostat newsrelease, 191/2010*, 13 December 2010, http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-13122010-BP/EN/2-13122010-BP-EN.PDF (25.02.2014)
- eurostat 2013** eurostat - Your key to European statistics. eurostat, 2013, <http://epp.eurostat.ec.europa.eu/> (11.06.2013)
- eurostat 2014** Migrant remittance and cross-border or seasonal compensation transfer statistics. *eurostat*, 26 February 2014, at 16:22, http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Migrant_remittance_and_cross-border_or_seasonal_compensation_transfer_statistics (08.03.2014)
- global-rates.com 2014** Worldwide interest rates and economic indicators. February 22, 2014, global-rates.com (February 22, 2014)
- Guyer 1972** Melvin J. Guyer and Anatol Rapoport: 2×2 games played once. *Journal of Conflict Resolution* 16: 409, 16 (3): 409-431, 1972
- IMF 2014** Is the Tide Rising? *World Economic Outlook UPDATE - An update of the key WEO projections, World Economic Outlook*, International Monetary Fund, Washington, DC, USA, January 21, 2014
- Krugman 1987** Krugman Paul R.: Is Free Trade Passé? *Economic Perspectives, Volume 1, No. 2: 131-144*, Fall 1987
- Kuhn 2009** Kuhn, Steven: "Prisoner's Dilemma". *Edward N. Zalta (ed.): Stanford Encyclopedia of Philosophy, Spring 2009 Edition*, 2009, <http://plato.stanford.edu/entries/prisoner-dilemma/> (09.03.2014)
- Lipman 1986** Barton L. Lipman: Cooperation among egoists in Prisoners' Dilemma and Chicken games. *Public Choice, Volume 51, Issue 3: 315-331*, 1986
- Ponticelli 2011** Ponticelli Jacopo and Voth Hans-Joachim: Austerity and Anarchy: Budget Cuts and Social Unrest in Europe, 1919 - 2009. *Centre for Economic Policy Research (CEPR): Centre for Economic Policy Research Discussion Paper Series, No. 8513*, London, UK, August 2011
- Ratha 2009** Dilip Ratha, Sanket Mohapatra, and Ani Silwal: Migration and Remittance Trends 2009. *Migration and Development Brief, 11*, November 3, 2009, <https://openknowledge.worldbank.org/bitstream/handle/10986/10958/521710BRIOMigr10Box345553B01PUBLIC1.pdf> (24.02.2014)
- U.S. Department of the Treasury 2013** U.S. Department of the Treasury, Office of International Affairs: Report to Congress on International Economic and Exchange Rate Policies. *Semiannual Report on International Economic and Exchange Rate Policies, October 2013*, U.S. Department of the Treasury, October 30, 2013
- Wolf 1999** Charles Wolf: Financial crises and the challenge of "Moral hazard". *Society, Volume 36, Issue 5: 60-62*, July/August 1999
- World Trade Organization 2013** World Trade Report 2013. ISBN 978-92-870-3859-3, World Trade Organization (WTO), Geneva, Switzerland, 2013