Balance sheets after the EMU : an assessment of the redenomination risk

Cédric Durabd, Sébastien Villemot

Working paper

BALANCE SHEETS AFTER THE EMU:
AN ASSESSMENT OF THE REDENOMINATION RISK

Cédric DURAND
UNIVERSITÉ PARIS 13

Sébastien VILLEMOT
OFCE-SCIENCES PO

ofce

Balance Sheets after the EMU: an Assessment of the Redenomination Risk[1]

Cédric Durand (Université Paris 13)
Sébastien Villemot (OFCE – Sciences Po)

10 October 2016

Abstract

The probability of a partial or complete break-up of the euro has risen over the last years. Such an event could create a balance sheet problem for economic agents, since the redenomination process could introduce significant currency mismatches between the asset and liability sides. We propose a new assessment of this redenomination risk, by country and by main institutional sector, for two scenarios: a single country exit and a complete break-up. Our main conclusion is that, even though the problem has to be taken seriously, its order of magnitude should not be exaggerated. Only a few sectors are at significant risk: public debts of Greece and Portugal, financial sectors of Greece, Ireland and Luxembourg. In particular, the consequences for the non-financial private sector should be manageable. We provide policy recommendations aiming at limiting the risk *ex ante*, and mitigating the consequences *ex post.*

1. Introduction

When it was introduced at the turn of the millennium, the euro was widely perceived as a major achievement for Europe, being both the consequence and the cause of an ever tighter continental integration. During the first years of the European Monetary Union (EMU) the apparent economic successes, coupled with cross-country convergence of several economic indicators, fueled this sentiment of success. The idea that the single currency was now "irreversible" had settled in most minds.

A couple of years later, the picture looks dramatically different. The world financial crisis has revealed imbalances that have led to the sovereign debt crisis and brought the EMU on the verge of dislocation. Member states turned out to be unable to devise a cooperative strategy, forcing the only truly federal institution—the European Central Bank (ECB)—to reinterpret its mandate by envisaging a massive intervention on sovereign bond markets (the Outright Monetary Transactions program). Even though this move has put a temporary halt to the crisis, it became soon clear that monetary policy alone could not save the eurozone. Indeed, the austerity policies that became the

---

1 The authors wish to thank the participants of the EReNSEP and OFCE seminars for their very helpful comments.

norm on the continent in 2011 fueled a protracted stagnation, with growth rates that look bleak in comparison to the United States and the United Kingdom.

The underperformance of the EMU has fueled popular resentment against the euro, now seen by a growing number of European people as the problem rather than the solution. Moreover, the possibility of a country exiting the euro became closer than ever in 2015 when the Greek banking system was *de facto* cut off from central bank refinancing, having to shut down for a few days and to impose capital controls during months. On the political side, the tension also reached a critical point when Wolfgang Schäuble suggested a "5-year humanitarian grexit", a threat to which the Greek people replied by rejecting the Eurogroup proposal in the July 2015 referendum, knowingly taking the risk of a euro exit. Even though the situation is now temporarily stabilized, the underlying causes of the Greek crisis have not been dealt with, and the "grexit" risk will inevitably come back to the forefront sooner or later.

The financial community itself seems to be prepared to the possibility of an exit or a dissolution of the single currency by cutting back on cross-border positions. The weight of cross-border holdings by monetary financing institutions of debt securities issued by euro area and EU corporates and sovereigns has diminished from about 60% in 2007 to 40% in 2015 ; in the meantime, the median degree of cross-border penetration of banking institutions has significantly fallen (ECB, 2016, graph S23 and S27). The intellectual mood is also shifting: leading thinkers, such as US economist Joseph Stiglitz (2016), or German Sociologist Wolfgang Steeck (2015) are among the most visible figures of a wider change of attitude in favor of the dismantlement of the eurozone.

A country exiting from the EMU, or even the dissolution of the single currency, is therefore no longer a theoretical possibility. Such an event would obviously have a major impact in a number of dimensions, economic, financial and political. On the economic side, the most obvious consequence would be the changing conditions in products markets due to the new exchange rates; uncertainty would prevail in the short run, but in the longer run the possibility of adjusting nominal parities would help with the unfolding of current account imbalances. There however exists another impact, less discussed, but potentially more disruptive: the changes in the balance sheet position of economic actors, resulting from the currency redenomination process. Assessing the unfolding of these balance sheet effects is crucial, because they could affect financial relations, investment and trade and, if not adequately managed, lead to productive disruption.

Indeed, the experience of financial crises in emerging countries in the nineties has underscored the vulnerability of these economies to foreign currency debt detained by private actors. In some situations, negative balance sheet effects could more than countervail the expansionary effects of a currency devaluation. Using a large sample of

non-G7 countries, Towbin and Weber (2013) establish that a high level of short term foreign debt results in such a negative growth outcome in the case of devaluation. Similarly, Bebczuk *et al.* (2006), using a panel of 57 advanced and developing countries, conclude that devaluations are contractionary if more than 84% of foreign debt is denominated in a foreign currency; moreover, if the economy is partially dollarized, the negative effect of devaluations is even stronger.

At the micro level, there is however some evidence of opposite tendencies. On a panel of 450 non-financial Latin American firms, Bleakley and Cowan (2008) show that firms tend to self-insure themselves by matching the currency denomination of their liabilities with the exchange rate sensitivity of their profits. As a consequence, after a devaluation, investment of firms indebted in dollars does not fall more than that of firms indebted in the domestic currency.

Some authors have also discussed the importance of the redenomination risk in the specific case of the euro area. Nordvig and Firoozye (2012, p. 56), for example, argue that "Balance sheets effects, *ex post* break-up, are likely to be very large for exiting eurozone countries" because of the significant external liabilities that would stay denominated in euros following the exit. The approach of the present paper is methodologically similar to theirs, in the sense that we also build estimates of relevant liabilities and relevant net positions after a euro exit, using decomposition by institutional sectors. There are however important differences: first, our data is more recent (2015 versus 2011); second, for determining the proportion of bonds that are likely to be redenominated, we use aggregate data provided by the Bank of International Settlements, while Nordvig and Firoozye (2012) build their own estimates using financial data at the micro level (which are potentially less complete); third, we estimated expected exchange rate movements using a fundamental equilibrium exchange rate methodology. The numerical results that we obtain are broadly consistent with those of Nordvig and Firoozye (2012), though there are some specific sectors and countries for which our estimates diverge significantly. However, the conclusions that we infer from our analysis are somewhat different from theirs, in particular because we go a bit further in the sectoral analysis, by providing estimates of balance sheet effects at the sectoral level and by discussing the sectoral-specific ways of dealing with the issue of balance sheet misalignment.

Another study by Amiel and Hippolyte (2015) specifically looks at the French case, warning of the huge costs resulting from the exposure of French firms to the redenomination of liabilities registered under foreign law in the case of the country's exit from the euro. Unfortunately, this study suffers from a number of shortcomings and provides a rather partial analysis: it focuses only on large non-financial corporations (excluding smaller ones); on the liability side, it looks only at marketable bonds, excluding loans; and more importantly, it does not look at the asset side, which could

provide a significant mitigation buffer. The authors also tend to exaggerate the problem of devaluation overshooting by considering that it concerns the total stock of debt (and not only the short term part of it). However, we share with them the conclusion that Nordvig and Firoozye (2012) underestimate the risk on the liability side for the French non-financial private sector.

In this paper, we propose a new assessment of the redenomination risk in the euro area. After having disentangled the mechanisms at stake, we assess the situation of cross-border financial interdependencies for the eurozone countries, evaluate the risk and their distribution, and identify the relevant policies to mitigate these risks. We argue that it is important to distinguish between the various kinds of liabilities and between sectors in order to address accurately the problem. Moreover, we stress that the potentially negative impact would not only concern devaluing countries but also countries experiencing a reevaluation of their currency, which would be a strong incentive to cooperate. Overall, we consider that policy discussion surrounding an alternative currency arrangement in Europe must take into account these balance sheet effects in order to make a euro exit or a break-up manageable, but that the importance of the problem should not be overestimated either.

2. The conundrum of balance sheet redenomination

The balance sheet impact of a euro exit on countries' economies depends on the size of currency mismatches that will appear on balance sheets after the redenomination process, on the direction of the exchange rate adjustment of the new domestic currency, but also on the sectoral distribution of the balance sheet movements.

2.1. The importance of the initial foreign currency mismatch

As a result of the redenomination process in a given exiting country, various assets and liabilities that were formerly denominated in euros will be converted into the new domestic currency (see the next sections for a more detailed discussion of this process). But some assets and liabilities will not, and those balance sheet items will now be counted as foreign currency items, on the same ground as assets or liabilities expressed in, for example, US dollars or UK pounds.

The exchange rate of the newly introduced domestic currency will then be adjusted relatively to the euro (or to the other European currencies in case of a complete break-up). The impact of this movement on balance sheets will depend on the direction of this movement, but also on the size and direction of the currency mismatch that may have appeared following the redenomination process. The currency mismatch can be measured by what we call the "initial net foreign currency position," *i.e.* the difference between assets and liabilities denominated in foreign currencies following the

redenomination process, but before the currency movement. Table 1 summarizes the balance sheet effect—expressed in the domestic currency of the country under consideration—depending on the direction of the currency move and on the sign of the initial foreign currency position.

Table 1: Impact of currency moves on balance sheet

	Initial Net Foreign Currency Position	
	A > L	A < L
Depreciation	+	−
Appreciation	−	+

A devaluation will negatively impact a balance sheet with a negative initial net foreign currency position, while it will benefit a sector or a country for whom foreign currency assets exceed foreign currency liabilities before the currency move. An appreciation of the domestic currency will have opposite effects, improving the balance sheet of a sector/country with an initially negative net foreign currency position, and deteriorating the position of a sector/country with a positive position.

The problem of a negative impact on balance sheets of domestic actors thus concerns not only a country with a negative net foreign currency position which will devalue, but also a country with a positive position which would experience an appreciation of its currency. Note that a negative impact tend to be the general case (though there are some exceptions), because countries for which the euro is overvalued (resp. undervalued) tend to accumulate foreign liabilities (resp. assets).

At this point, one could wonder how a currency movement could have a negative impact on all countries. After all, it should amount to a zero-sum game, since the wealth of the appreciating countries increase as much as the wealth of depreciating countries diminishes. This is of course true when all net worths are expressed in a given third party currency, but we are here considering the impact of currency movements on balance sheets *expressed in domestic currencies*. It is perfectly possible that the net foreign position of appreciating countries both *increase* when expressed in some third party currency, and *decrease* when expressed in the (appreciating) domestic currency; our point is that this is precisely the general case.

It should also be kept in mind that, even though the *net* foreign currency position is important, it does not summarize all the relevant information. In particular, even if the aggregate net position is positive (at the national or sectoral level), it may happen that foreign currency assets are not detained by the same agents as those with foreign currency liabilities. In that case, the mitigation potential of assets in the case of a

depreciation would be rather limited (unless redistributive policies are put in place). It is therefore also important to look at *gross* assets and liabilities in foreign currency.

2.2. Varieties of instruments

All instruments on the balance sheet do not have the same relevance for assessing the risk following from a euro exit or break-up.

One should first distinguish between liabilities and assets depending on the location of the counterparty. In most cases, balance sheet items exhibiting a foreign currency risk have a counterparty that is located abroad. It is therefore natural to begin by looking at the net foreign position of economic agents, since this concept by definition summarizes the assets and liabilities which have a non-resident counterparty. There are also a few balance sheet items denominated in foreign currency whose counterparty is resident; we discuss these further below.

Table 2: Criticality of the various instruments for the balance sheet position in the case of a depreciation

	EXTERNAL ASSETS	EXTERNAL LIABILITIES
FOREIGN DIRECT INVESTMENT		
PORTFOLIO EQUITY SECURITIES		
BONDS (LONG TERM)		
LOANS (LONG TERM)		
BONDS (SHORT TERM)		
LOANS (SHORT TERM)		
CROSS-BORDER DEPOSITS		
DERIVATIVES		
RESERVE ASSETS		

	NEUTRAL	NOT CONSIDERED
POSITIVE	NEGATIVE	HIGHLY NEGATIVE

The various instruments contributing to the net exterior position do not have the same relevance for the risk that we want to assess. Table 2 summarizes the asymmetric distribution of vulnerabilities and countervailing forces across the spectrum of the balance of investment. In green, on the asset side, are all the foreign assets that could contribute to improving the international position of a balance sheet in conditions of

financial stress due to currency devaluation. In orange and red, on the liability side are the instruments that make one sector vulnerable.

Since equity (both direct and portfolio investment) are not financial contracts expressed in monetary terms, there is no redenomination issue *per se*. This does not mean that there is no effect on the balance sheet however. On the liability side, a post-exit devaluation indeed does not change anything, because the accounting valuation does not depend on the exchange rate. But, on the asset side, investments being written at their market value, a devaluation increases the latter in terms of the domestic currency. As these positions could potentially be liquidated, this has a positive impact on the balance sheet position.

For financial contracts that involve an obligation in monetary terms (like bonds, loans and deposits), the redenomination process will determine whether they are converted to the new domestic currency (at a rate fixed by the new monetary law), if they remain in euros, or are converted to some other currency if the euro disappears.

It is not the purpose of the present paper to analyze and discuss the legal aspects of this process. We rather rely on existing analyses, in particular Proctor (2011), Nordvig and Firoozye (2012, chapter 3 and appendix I) and Amiel and Hyppolite (2015, section III). The picture that emerges is that, for a given contract, the governing law is the most important factor for determining the outcome of the redenomination process. If the contract is under domestic law, it is very likely to be redenominated in the new domestic currency; on the contrary, if it is governed by foreign law (typically English or New York law), it will most likely stay denominated in euros (or, in the case of a complete euro break-up, it will most likely be redenominated into a new ECU or into the domestic currency of the counterparty—in any case a foreign currency). There are some exceptions to this rule, for example in the case where the contract has a provision clearly tying it to the currency of a country distinct from the governing jurisdiction. Other factors, such as whether the euro exit is legal or not from the point of view of international law, can also influence the outcome of some specific cases. But the point is that the governing law is the main determinant, and we will therefore use it in this paper as a proxy for the likelihood of redenomination.

It is important to understand that, even if a legally valid redenomination followed by a depreciation is a default from an economic point of view, it is not so from a legal perspective. This has important consequences: it means that, after a lawful redenomination, legal actions against debtors would fail, debtors would not be downgraded to default status by rating agencies, and credit default swaps would not be activated.

The importance of the governing jurisdiction is illustrated by the Greek 2012 restructuring: the new discounted bonds offered to foreign investors were emitted under English law (while retired bonds were under Greek law), so that investors would have a stronger legal case for asking repayment in euros even after a hypothetical Grexit and the introduction of a new drachma.

Applying the governing law principle to cross-border deposits in euros, one sees that they will end up being denominated in the currency of the bank's residence. Therefore, they contribute positively on the asset side and are neutral on the liability side. There could be deposits denominated in some external currency that will not follow this pattern, but they represent only a small fraction of the total.

Cross-border loans tend to be governed by foreign law, typically a third-party country law, both on the liability and on the asset side (though on the latter case there could be more exceptions). They therefore contribute positively on the asset side, and negatively on the liability side.

Turning to international bonds, they are most frequently governed by foreign law on the asset side (except the rare case of bonds emitted by foreign companies under the domestic jurisdiction). On the liability side, there is no general rule: domestic entities emit under both domestic and foreign law, so the breakdown between the two options has to be empirically assessed.

To summarize, only debt instruments could lead to disruptive evolution in cases of strong exchange rate devaluation, while the economic actor can rely on a wider range of assets to mitigate negative evolutions. As noted by Frankel (2005) in the case of emerging countries, the key problem is short term debt denominated in foreign currency (and under foreign law in the euro area): the principal repayment for this category of liabilities will have to be done in the aftermath of the euro exit, which is likely to be a chaotic period. In particular, there is a risk of exchange rate devaluation overshooting, which can make short term repayments even more difficult. Moreover, the mitigation actions meant to address the foreign currency debt problem (asset selling, fiscal or monetary policy intervention) may materialize with a delay, and therefore fail to solve the liquidity problems of agents facing immediate repayment obligations.

Note that we keep derivatives contracts out of our analysis because their opacity and complexity make it very difficult to disentangle their overall impact, although one can guess that it will be mainly directed to financial corporations.

Also note that, in the case of currency appreciation, the dynamics is the opposite. The asset side of the foreign balance sheet will deteriorate across all positions, while the immediate improvement of its liquidity position will materialize only as far as its debt liabilities are reduced. Consequently, the more direct negative balance sheet effect

should concern countries with a positive external position, which face a currency appreciation. Of course, as their point of departure is better, they are less prone to suffer from disruptive spillovers into a full-blown financial and economic crisis.

So far we only looked at assets and liabilities whose counterparty is non-resident. But there are foreign currency-denominated balance sheet items whose counterparty is a resident agent. The typical case is a public or private bond emission, governed by foreign law, but purchased at least in part by domestic agents. In the case of the euro exit of a single country, the domestic holders of the bonds will be entitled to claim repayment in euros (in the case of a complete euro break-up, since both parties are resident of the same country, a redenomination into the domestic currency is more likely, though not warranted). It should however be kept in mind that, if the redenomination process in this context has a redistributive impact across domestic agents (and possibly across domestic sectors), it has no impact on the aggregate position of the country. The mitigation of those balance sheet effects could therefore be possible through redistributive fiscal policies.

2.3. Varieties of sectoral logics

The socioeconomic problem of balance sheet deterioration differs considerably depending on the sector considered. In the case of the public sector, the main issue is the ability of the state to fund its current activities, which depends mainly on its primary balance. Indeed, for the state, defaulting is always an option, and any negative evolution of its balance sheet could lead to a restructuring of its debt which terms would be more or less favorable, depending on its ability to pay without external funding for its current expenses.

In the case of the financial sector, unsustainable foreign currency liabilities could cut off national institutions from financial markets, which would affect domestic activity mainly through a credit crunch. A mitigation policy to prevent a collapse of domestic activity would therefore include bank restructurings, an active monetary policy and a credit expansion by public institutions (see section 7.2 for a more detailed discussion).

The impact of a deterioration of the balance sheet of non-financial firms could be more directly disruptive, although it could also fuel positive aggregate dynamics on the longer term. Figure 1 details the mechanisms at stake.

Figure 1: Non-financial sector vulnerability to a currency move with negative balance sheet effects
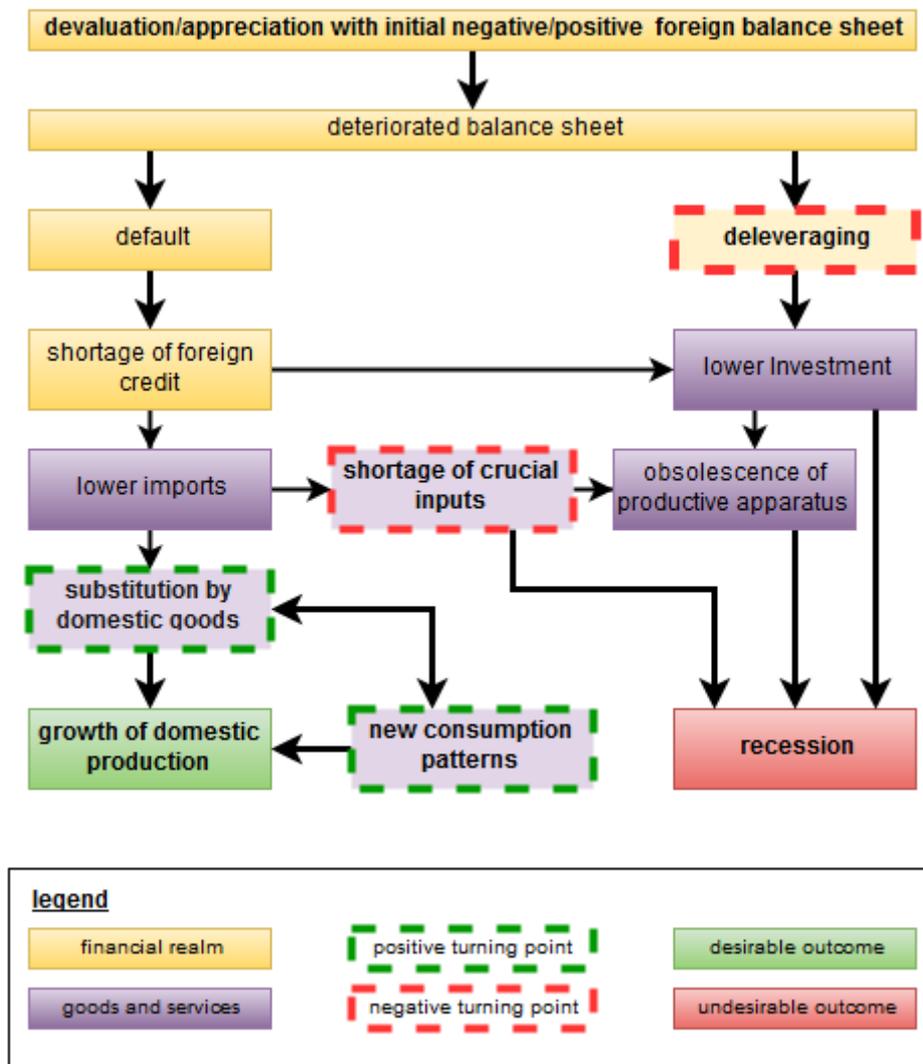
The first channel is straightforward. A deterioration of one sector's balance sheet will lead to higher borrowing costs and deleveraging, with a negative impact on investment. Spillovers to the broader economy will follow through a direct short term negative macroeconomic effect in terms of lower demand, fueling recessionary pressure and, on the longer term, degrading the development path through an obsolescence of the productive apparatus.

The other channel results from the possible default on foreign liabilities resulting from the deterioration of the balance sheet. Its immediate consequence will be a shortage of foreign credits, leading to a diminishing of imports. The impact on the domestic economy is ambiguous. On one hand, the economy could be deprived of crucial inputs, resulting in a direct contraction of the activity and, indirectly, to an obsolescence of the productive apparatus. However, it could also fuel a substitution of foreign goods by

domestic goods, which could reinvigorate the domestic economy, but which implies an adaptation of the domestic demand.

These mechanisms point to four turning points where policies must focus. First it is crucial to mitigate deleveraging by voluntary monetary and credit policy in order to resist the downward pressure on investment. The authorities must also identify the crucial foreign inputs and design adequate policy tools to guarantee their ongoing provision. On the other hand, industrial policy must be implemented in order to favor imports substitution on the supply side but also on the demand side, enhancing sustainable and localized consumption patterns.

3. A look at net international investment positions

A first way to approximate the exposure of balance sheets to the redenomination risk is to look at international investment positions. Data on those are available for the economy as a whole, and for broad institutional sectors. They aggregate all financial instruments with a non-resident counterparty, *i.e.* liabilities of residents to non-residents, and assets of residents over non-residents.

These statistics are obviously just an approximation of the foreign currency mismatch that we want to measure. Indeed, as explained above, part of the domestic liabilities to foreign residents are under domestic law, and are thus not subject to an exchange rate risk. Conversely, some assets governed by foreign law involve two domestic parties and therefore do not appear in international investment positions; there is an exchange rate risk on those assets, which has a redistributive impact across sectors, though it does not create an aggregate risk at the national level. These strong limitations being said, the data on national and sectoral foreign positions are quite instructive.

The data that we use for international investment positions as of Q3 2015 are based on the balance of payment statistics released by Eurostat, which for each country offer a breakdown both by sector and instrument. There are however quite a few missing figures in the raw Eurostat data, so we filled the gaps by exploiting other sources that give most of the missing information (World Bank's Quarterly External Debt Statistics, IMF international investment position data for France, Banca d'Italia, Bank of Finland). In a few rare cases (sectoral breakdown of foreign direct investment for France, Austria and Portugal), we had to compute rough estimates by assuming a breakdown similar to the Eurozone average.

Figure 2 presents both gross and net international investment positions, which vary substantially across eurozone countries. Countries are ordered from left to right by decreasing net position.

11

Figure 2: Overall international investment positions of eurozone countries (% of GDP, Q3 2015)

Sources: Eurostat, IMF, World Bank, Banca d'Italia, Bank of Finland, authors' computations
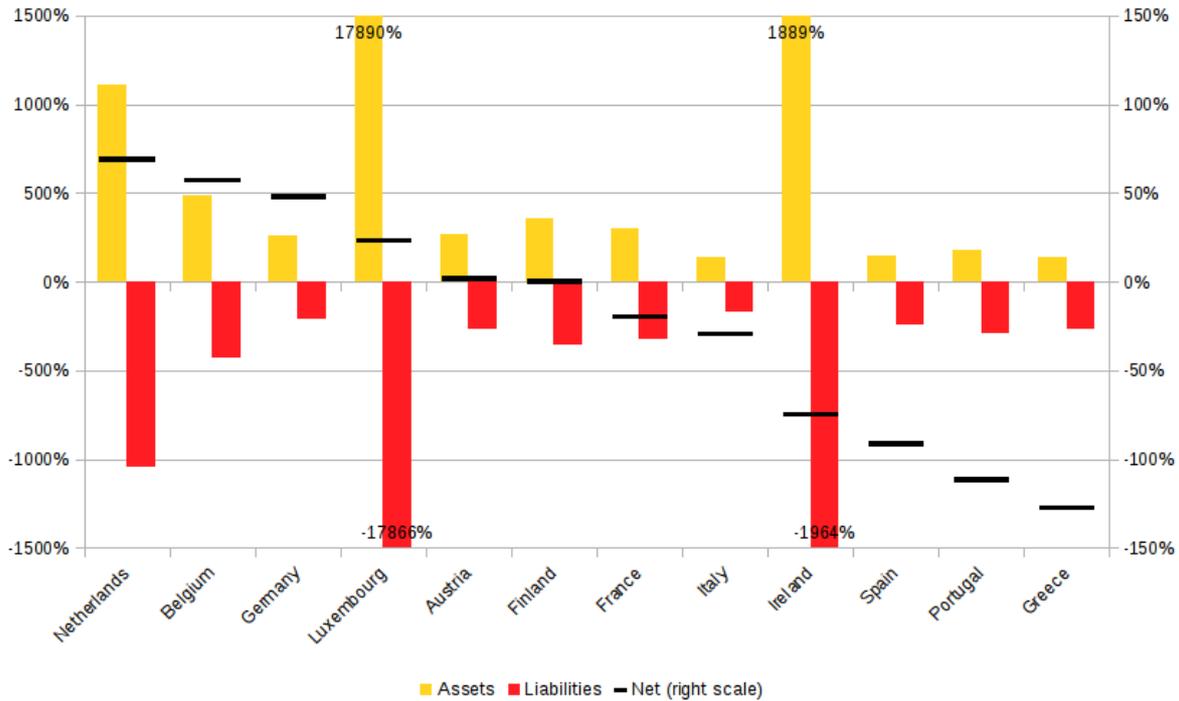
The first striking fact on this graph is the astonishing level of gross assets and liabilities of Luxembourg, which are both close to 170 times GDP, confirming the country's singular status of financial intermediary and tax heaven. Medium-sized countries like Ireland and the Netherlands also have very important balance sheets with assets and liabilities well above 10 times their GDP, due to their status of financial intermediary, and which suggest a high level of vulnerability to exchange rate adjustments.

Among big countries, there is a clear divide between the periphery (the GIPSI – Greece, Ireland, Portugal, Spain, Italy) plus France which have an overall net negative position, and the core (Germany, Belgium, Netherlands) with an overall positive position. This divide is consistent with the relative positions in terms of current account surpluses and deficits, since external positions are the stocks corresponding to these flows accumulated over the years.[2]

The aggregate statistics at the country level mask an important intra-country heterogeneity across sectors. Figure 3 shows the breakdown of the net international investment positions across four institutional sectors: general government, central bank, monetary financing institutions (MFI henceforth; mostly banks, excluding the central

---

2 Note that valuation effects also enter the dynamics of the international investment position and can make it diverge from the intertemporal sum of current account surpluses or deficits. See for example Puppetto and Sode (2012) for an analysis of the valuation effect on a sample of advanced and emerging countries.

Figure 3: Net international investment position, sectoral breakdown (% of GDP, excl. fin. derivatives, Q3 2015)

Sources: Eurostat, IMF, World Bank, Banca d'Italia, Bank of Finland, authors' computations
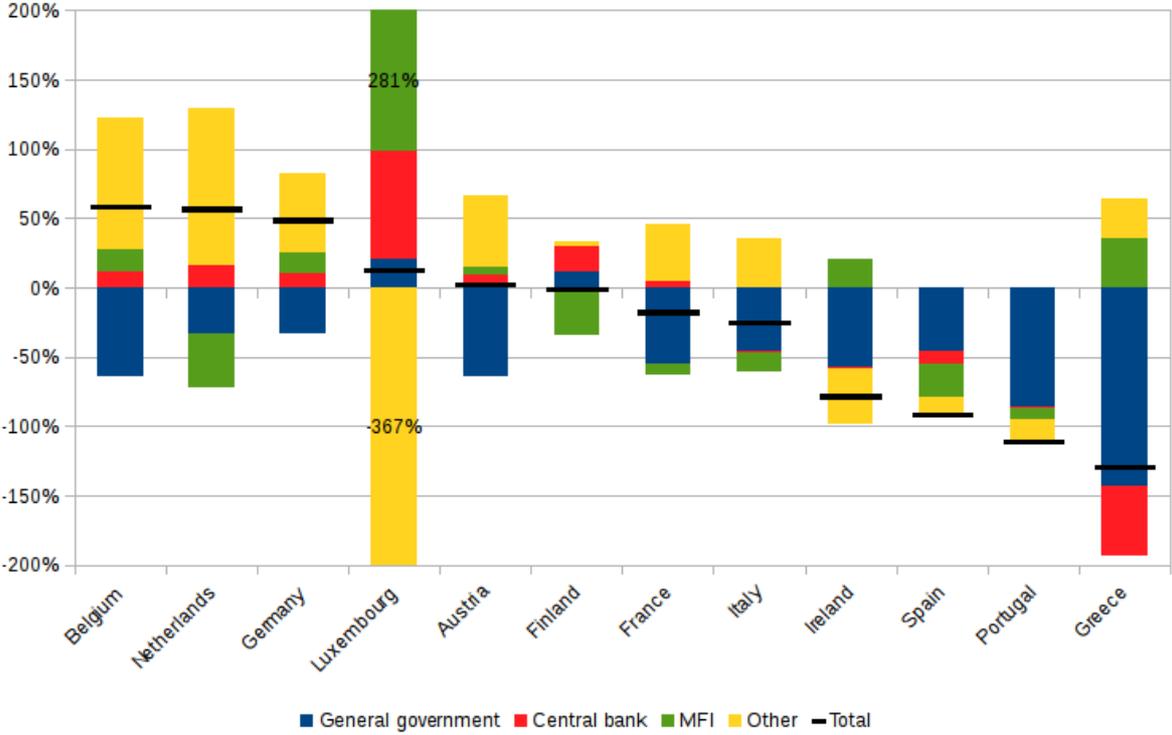
bank), and the other entities (which include households, non-financial firms, and some financial non-banking firms).

The external balance sheet of the general government is widely negative for most countries, reflecting the internationalization of public debt markets, with Portugal and Greece being the more exposed at respectively –83 % and –143 % of GDP. However, as we shall see later, most of the public debt is emitted under domestic law, protecting it from the redenomination risk. Greece is an exception, because of the 2012 restructuring, but for this country a new debt relief is in any case necessary.

The central bank position is small for most countries. It is only highly negative in the case of Greece, mostly corresponding to the TARGET2 balance of the country, which is itself the counterparty of the Emerging Liquidity Assistance (ELA) granted to Greek private banks by the National Bank of Greece.

The financial sector balance sheets are not distributed along a core-periphery axis. Ireland and Greece have a net positive external position, while the Dutch financial sectors has a strongly negative position. Luxembourg's financial sector external balance sheet is highly positive at +281%.

The "other" sector includes non-financial actors (households and non-financial corporations) as well as some financial non-banking actors. It is thus a wide category

that allows for a conservative assessment of the exposure of the real private economy to the balance sheet redenomination risk. Figure 3 is remarkable as it stresses the very limited exposure of peripheral countries to this risk. The balance of the Greek "other" sector is for example positive at 29% of GDP, while it is only mildly negative for Spain, Portugal and Ireland at respectively –12%, –16% and –41%. The positions of Germany and France are more strongly positive (+57% and +41%). Luxembourg has a very high negative position (–367%) with a huge balance sheet (not on the graph). At the opposite, we find the Netherlands, with a highly positive balance of +113%. The huge MFI and "other" sectors balance sheet comforts the view that tax evasion schemes involving these last two countries are very important, as documented by the European Commission for Fiat and Starbucks.[3]

4. Relevant debt

The previous section presented the international investment positions by country and by sector, which gives only an approximation of the balance sheet at risk in case of euro exit.

We now turn to a more accurate assessment of the foreign currency mismatch problem, beginning with the liability side. As shown on Table 2, only the debt components (loans and bonds) are at risk. Other components will not be affected by the change of currency, either because they are not directly expressed in monetary terms (like equity), or because they will be redenominated in the new domestic currency (like deposits in domestic banks). And among loans and bonds, some will be redenominated in the new currency, as explained in section 2.2, depending on their governing law. What we are interested in is therefore the "relevant debt", *i.e.* the sum of the loans and bonds that will remain in euros (in case of a single country exit) or that will be redenominated in some other foreign currency (in case of a complete break up).

In order to identify bonds that are governed by foreign law, we use the Bank of International Settlements' (BIS) debt securities statistics. The database distinguishes bond issues depending on their issue market, domestic or international. Since the 2012 release of that database, bonds that have a foreign governing law are always classified as international, though some bonds governed by domestic law can also be classified as international (see Gruić and Wooldridge, 2012, box 2, p. 70). In our analysis, we therefore use international bonds as defined by the BIS as a proxy for foreign law bonds; since our relevant debt estimates may overstate the true figures, they should therefore be considered as an upper bound on the currency risk.

---

3   See http://europa.eu/rapid/press-release_IP-15-5880_en.htm.

Concerning loans, we make the assumption that loans from foreign bank are under foreign law, while law from domestic banks are under domestic law. The World Bank's Quarterly External Debt Statistics (QEDS) provide figures for cross-border loans, with a breakdown by institutional sector, that we use as a proxy for foreign law loans.

Figure 4: International bonds issued by governments (% of GDP, Q3 2015).

Source: BIS
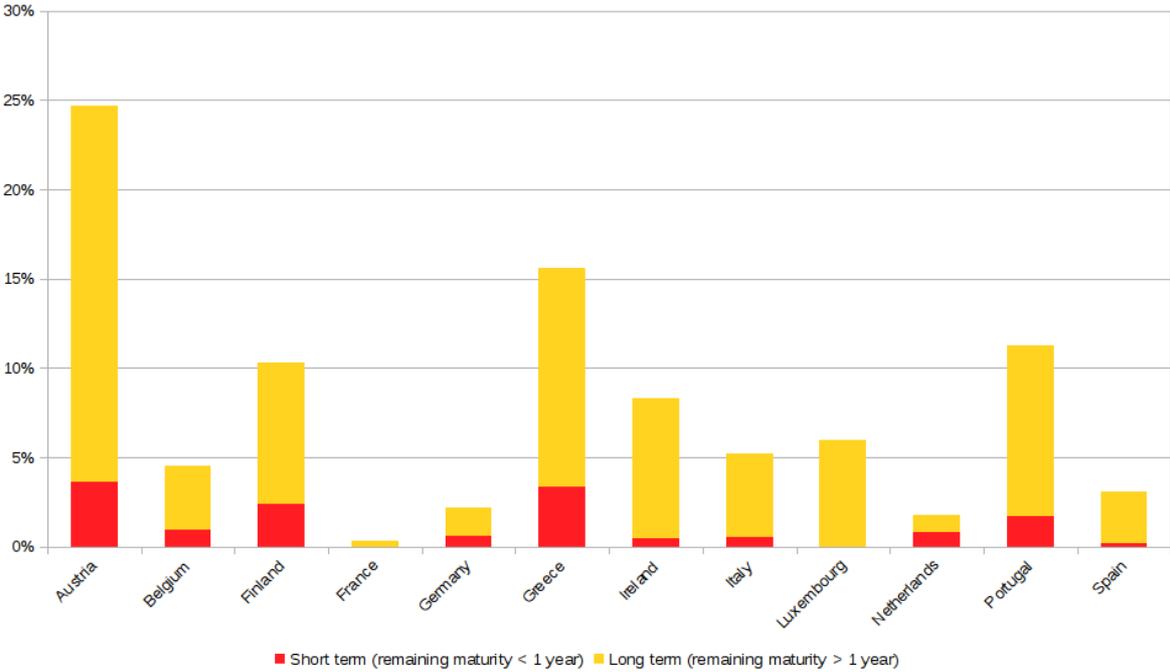
We begin by looking at the relevant debt of the general government sector. Figure 4 shows the international bonds emitted by eurozone governments, with a breakdown depending on the maturity (since short term bonds are likely to be more problematic, as discussed in section 2.2). Overall, government bonds do not represent a very high risk, since international bonds represent 10% or less of GDP for most countries. It is even almost zero for France. There are two exceptions: Austria, with about 25% of GDP in international bonds, and Greece with 15% (mostly English law bonds emitted during the 2012 restructuring). Moreover, short term bonds represent only a small fraction of the total.

Similarly, Figure 5 indicates the loans at risk for the general government sector. Countries that undergone an adjustment program clearly stand out on that graph: Greece, Ireland, Portugal and Spain, which received loans from other Eurozone governments, or from institutions like the European Financial Stabilisation Mechanism (EFSM), the European Financial Stability Facility (EFSF) or its successor the European Stability Mecanism (ESM). In particular, external loans of the Greek government represent 126% of the country's GDP, and today constitute the bulk of Greece's public

15
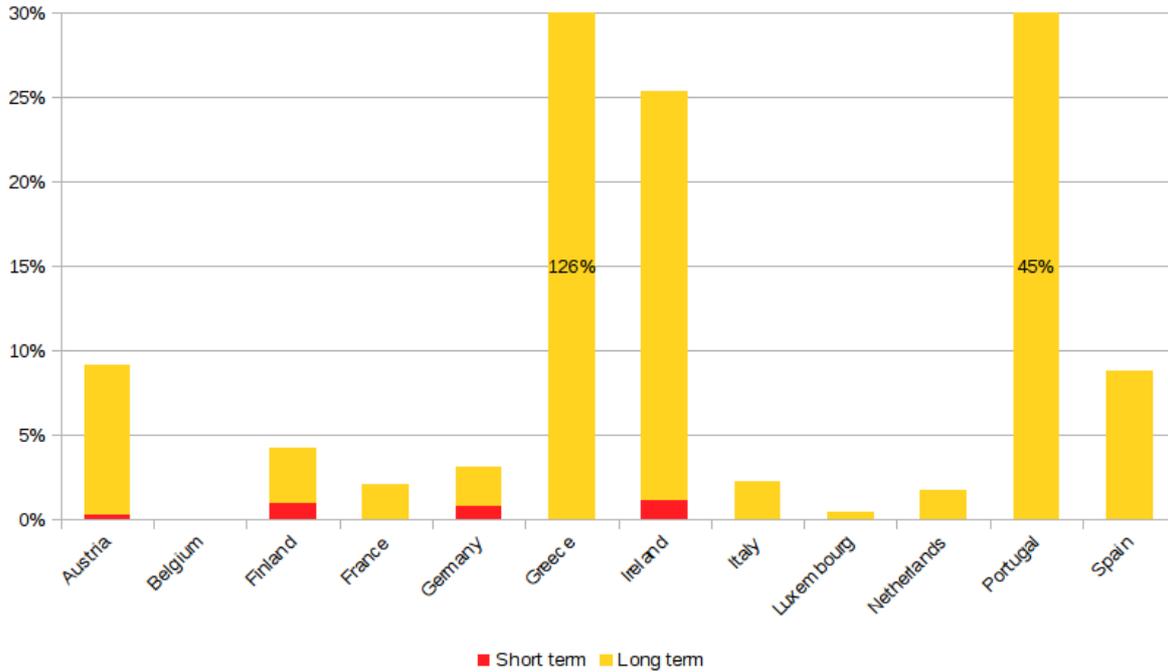
debt. Again, Austria stands as an exception, since it is the only non-program country with more than 5% of GDP of external loans.

As mentioned in section 3, one should also look at the central bank positions in order to get the full picture for the public sector. However, most of the external position of central banks is related to TARGET2 balances (see appendix 10.2) and to banknotes issuance (Whittaker, 2011): in both cases, it is difficult to distinguish between a liability and an asset side, and only the net position is available. We therefore cannot construct a relevant debt indicator for central banks, and will only provide a relevant net position for them in the next section.

Figure 6 presents international bonds emitted by financial corporations (banks and non-banks alike), both short and long term.[4] First, one can see that the relevant debt levels are higher for financial corporations than for governments: for most countries, they represent between 20% and 40% of GDP. Three exceptions stand out: Luxembourg, Ireland and the Netherlands, which have much higher levels, due to their status of financial intermediaries. Also note that the share of short term debt tends to be higher than for governments. In particular, the proportion of short term debt is very high for Greek banks, probably due to their perceived riskiness by markets which makes long term borrowing too expensive for them.

---

4 We don't report the corresponding figures for loans, since they are very small; interbank lending essentially takes the form of security trading.

Figure 6: International bonds issued by financial corporations (% of GDP, Q3 2015).

Source: BIS

Figure 6: International bonds issued by financial corporations (% of GDP, Q3 2015).
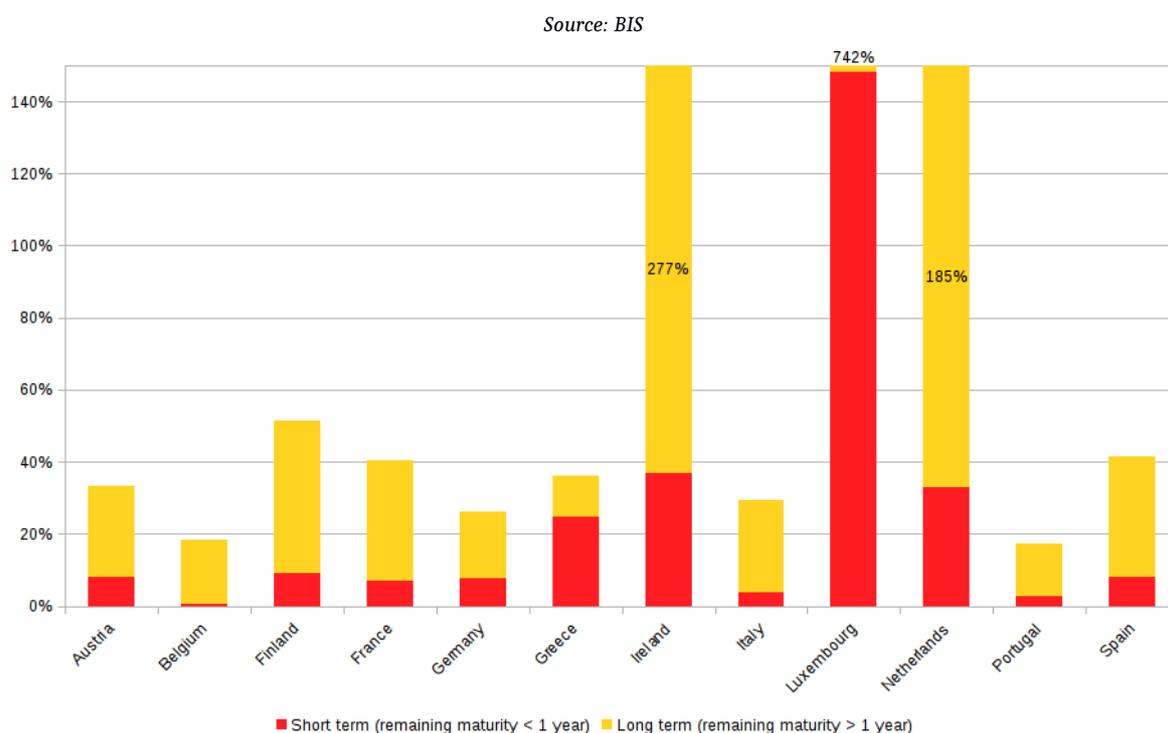
Source: BIS

Figure 7 reports the international bonds issued by non-financial corporations. Luxembourg, where those stand at 25% of GDP, is the usual outlier, suggesting that some corporations classified as non-financial may also be involved in financial intermediation. At the other extreme, it is interesting to see that the GIPSI countries are precisely those where non-financial corporations are the less exposed to foreign law bonds (Germany being the only other country with a similarly low exposure). Total foreign bonds levels are also rather small in absolute terms, between 2% and 6% of GDP for those countries. This may reflect either a structurally smaller financial integration or the fact that the crisis has engendered a refragmentation of eurozone financial markets; in any case, the productive sector of the GIPSI countries is not so much vulnerable to a currency shock via the bond channel. The difference between Germany and France is also striking: France's non-financial sector is four times more exposed than Germany's to that kind of shock.

Concerning cross-border loans of non-financial corporations, one faces a difficulty: the only data available to our knowledge come from the balance of payments statistics (see Figure 8), which aggregate non-financial corporations with non-banking financial corporations, households, and non-profit private organizations. The inclusion of households and non-profit is probably not a big issue since one can reasonably assume that they don't borrow much abroad; but non-banking financial firms are susceptible to blur the picture. The statistics that we report are therefore meant to provide an upper bound of the risk for the non-financial firms. Indeed, Luxembourg, Ireland and the

Figure 7: International bonds issued by non-financial corporations (% of GDP, Q3 2015).

Source: BIS
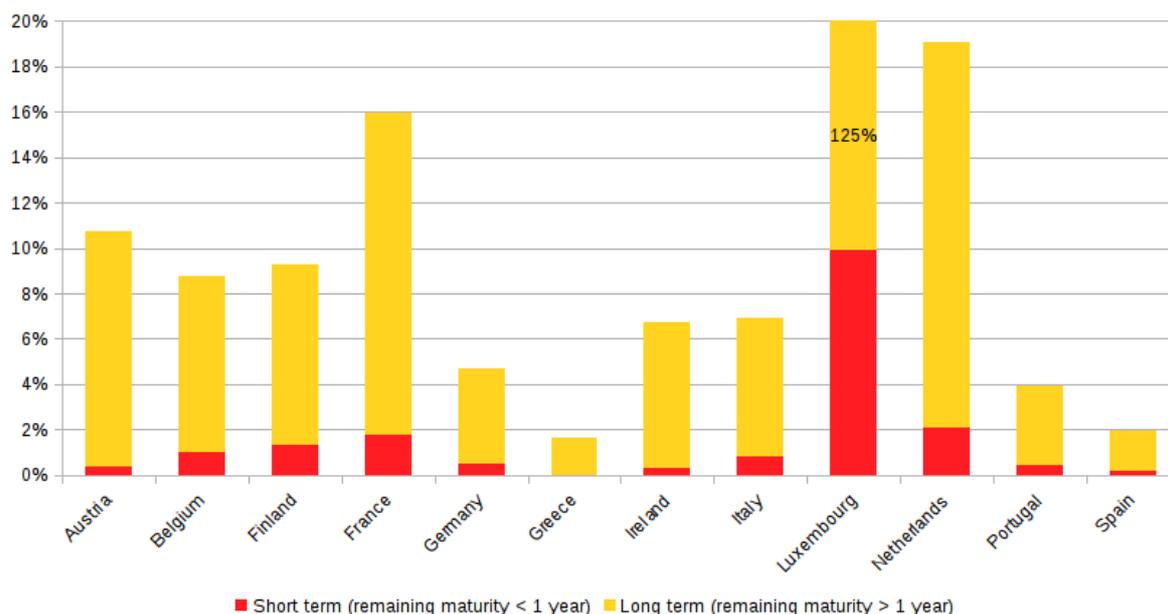
Netherlands appear to be the usual outliers, with very high loans levels, which suggests a significant financial component in their data. For the other countries, the average exposure is of 10% of GDP, with a significant short term component. France is above the average, with 14% of GDP, mostly short term: it is impossible to say if this comes from the high level of financialization of the French economy, or because French non-financial firms tend to contract more loans abroad (as this is the case for bond issuance, see previous section). Spain is also above the average, at 13% of GDP, but with a longer maturity.

We conclude this overview of the debt at risk by constructing summary statistics by sector. Table 3 gives, for each of the three sectors, the total of the debt at risk and its short term component.[5] Note that, for the reason explained above, the loans of the non-banking financial corporations are attributed to the non-financial corporations sector, so the latter figure is possibly overestimated (while the financial sector risk is possibly underestimated by the same amount).

---

5 Note that our relevant debt measures do not include debts classified as foreign direct investment; see appendix 10.1 for more details on this issue.

Figure 8: Cross-border loans of corporations (excl. MFI) and households (% of GDP, Q3 2015).

Source: World Bank QEDS
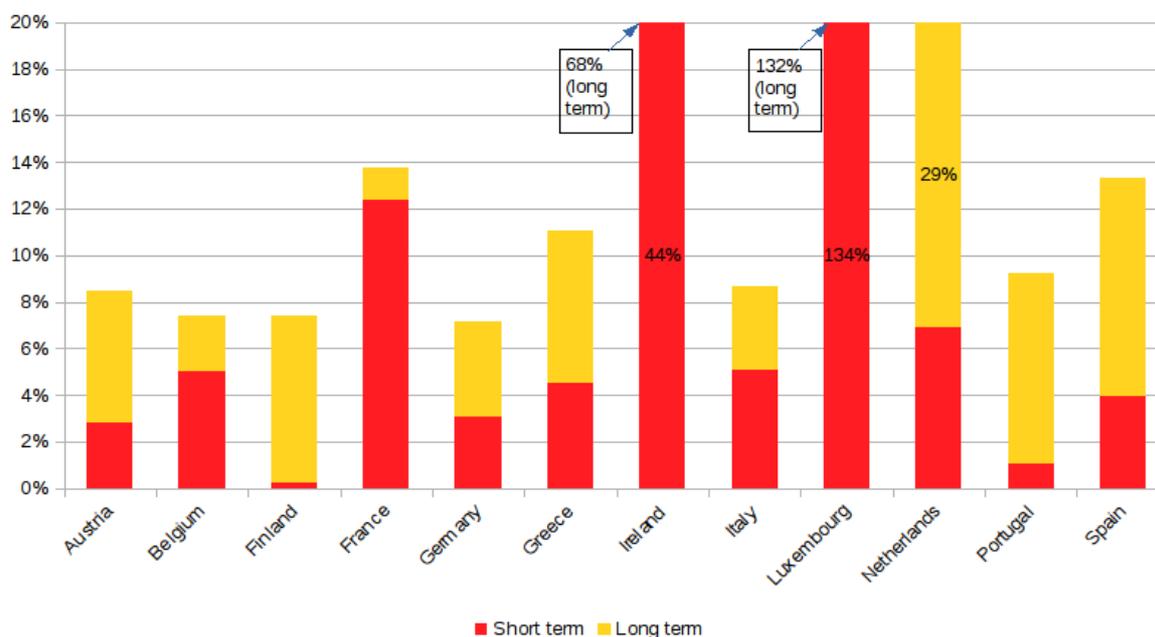
Table 3: Relevant debt by sector (% of GDP, Q3 2015)

Sources: BIS, World Bank QEDS, authors' computations

	Greece	Italy	Portugal	Spain	Ireland	France
General government	142%	8%	57%	12%	35%	2%
incl. short term	3%	1%	1%	0%	2%	0%
Financial corporations	42%	30%	18%	43%	395%	42%
incl. short term	29%	4%	2%	8%	98%	8%
Non-financial corps. + households	13%	18%	20%	15%	312%	33%
incl. short term	5%	8%	8%	4%	53%	17%

	Germany	Netherlands	Austria	Luxembourg	Belgium	Finland
General government	6%	5%	35%	7%	10%	17%
incl. short term	2%	2%	4%	0%	2%	6%
Financial corporations	28%	225%	35%	876%	22%	59%
incl. short term	9%	36%	8%	135%	1%	17%
Non-financial corps. + households	20%	66%	23%	910%	23%	20%
incl. short term	5%	18%	6%	385%	13%	4%

5. Relevant net position

The previous section has studied the currency risk on liability side of the balance sheet, which is the main problem in the case of a devaluation.

However, the asset side may be useful for mitigating the devaluation problem, since assets in foreign currency will become more valuable in the domestic currency. Moreover, in the case of a currency appreciation, it is from the asset side that difficulties can arise.

Figure 9: Relevant net position (% of GDP, excl. fin. derivatives, Q3 2015)

Sources: Eurostat, IMF, BIS, World Bank, Banca d'Italia, Bank of Finland, authors' computations
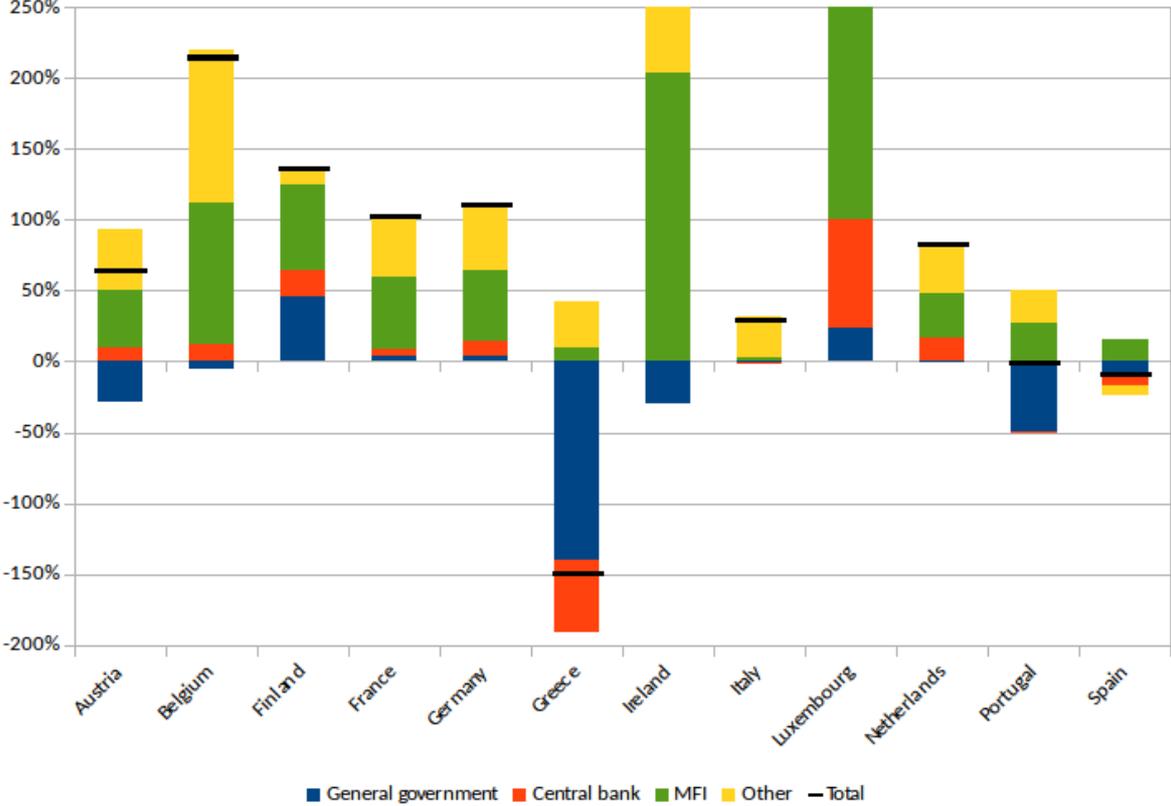
In this section we present our estimation of the relevant net position (*i.e.* the net foreign currency position as defined in section 2.1) for economies as a whole and by sector. Figure 9 presents the results as a graph, while Table 4 present them in tabulation form.

Table 4: Relevant net position (% of GDP, excl. fin. derivatives, Q3 2015)

Sources: Eurostat, IMF, BIS, World Bank, Banca d'Italia, Bank of Finland, authors' computations

	Greece	Italy	Portugal	Spain	Ireland	France
General gov't	-140%	−1%	−50%	−8%	−30%	4%
Central bank	-51%	−1%	−1%	−9%	0%	5%
MFI	10%	3%	28%	15%	204%	51%
Other	32%	29%	23%	−7%	428%	44%
Total	*-149%*	*30%*	*0%*	*−9%*	*601%*	*103%*

	Germany	Netherlands	Austria	Luxembourg	Belgium	Finland
General gov't	4%	0%	−29%	23%	−6%	46%
Central bank	10%	17%	10%	77%	12%	19%
MFI	50%	31%	41%	1338%	100%	60%
Other	47%	35%	42%	5363%	109%	12%
Total	*111%*	*83%*	*64%*	*6801%*	*215%*	*137%*

On the asset side, all components of the international investment position have been included, with the exception of the foreign direct investment:[6] we consider that, because of its strong illiquidity, the mitigation potential of that class of asset is too low to be relevant. On the liability side, we use the relevant debt concept presented in the previous section. The net relevant position is the difference between the relevant assets and the relevant debt.[7] A negative (resp. positive) position indicates an exposition to a nominal depreciation (resp. appreciation) risk.

Note that the sectoral breakdown is the same as for the international investment position figures of section 3. In particular, the "other" sector includes the non-banking financial sector; this means that on the liability side we do not follow the same convention as in the previous section, for consistency with the asset side.

---

6   As shown on Table 2, all assets components of the international investment position are sensitive to currency movements. Note that in addition to FDI, we also exclude financial derivatives, because of the difficulty in interpreting the data.

7   Note that there is no inconsistency of treatment between the liability side and the asset side. As a first example, consider an ESM loan granted to some periphery country. From the point of view of that periphery country, it is clearly a foreign currency debt. But from the point of view of creditor countries, it is also a foreign currency asset, because upon their exit from the euro zone the loan would remain denominated in euros (or in the equivalent of the ECU in case of complete break up). As a second example, consider a bond emitted by a French firm under foreign law (typically English or New-York law) and detained by a German entity. From the point of view of France, this is clearly a foreign currency liability, both in case of French exit or complete break-up (in the latter case, redenomination is unlikely to be in Francs). From the German perspective, in case of a German exit, the bond would remain in euros and it is correct to count it as a foreign currency asset. The situation is a little more complex in the case of a complete break-up: it should also be redenominated in the equivalent of the ECU but there is a higher degree of juridical uncertainty, as a court could decide to redenominate it in Deutschmarks (though other options are also possible, like UK pounds, US dollars or a basket of currencies); counting it as a foreign currency could not be correct in that case.

The most striking fact that emerges from the analysis is that the relevant net position is positive for all countries in aggregate, the only exceptions being Greece and Spain. Moreover, the sectors representing the private sector (MFI and "other") are also always in positive territory, with the exception of the "other" sector in Spain. On the government side, Greece and Portugal exhibit a very negative position, while Austria and Ireland have a mildly negative one.

This results indicates that for those countries that are likely to experience a post-euro devaluation, *i.e.* the GIPSI and France, there is no aggregate balance sheet risk for the private sector (except for Spain), and even no risk for the public sector in some cases. This does not mean that there is no problem, because the holders of the sensitive assets may not be the same as those of the sensitive liabilities, but at least there is room for maneuver.

Conversely, the significantly positive position of those countries that are likely to experience a post-euro appreciation (Germany, the Netherlands, Austria) indicates that they are also at risk. Their assets accumulated abroad would lose part of their value if they were to abandon the single currency. This means that countries which have a weight significant enough to endanger the EMU if they were to leave, like France, Spain or Italy, have a bargaining power that is much greater than what a superficial current account analysis may suggest.

6. A composite risk index

So far we have analyzed the balance sheet risk by first focusing on the liability side (both short and long term), and then by looking at the total balance sheet subject to a post-euro currency risk.

In this section, we construct a composite risk index that synthesizes all these dimensions of the problem into a single indicator. Indeed, as mentioned before, both the relevant debt and the relevant position matter: the former is the most acute issue for countries undergoing a depreciation, while the latter can help to mitigate the debt problem, and at the same time constitutes the problem for countries undergoing an appreciation. Moreover, we have seen that the short term component of the relevant debt is the most problematic one, and should therefore be overweighted in the composite risk index.

As we have seen, the direction of the exchange rate adjustment (depreciation or appreciation) is central for assessing the nature of the country and sectoral risk. But one also needs to know the expected magnitude of that adjustment for a more precise analysis. Exchange rate movements are particularly hard to foresee—and even more so in the context of an unprecedented event like a euro exit; it nevertheless makes sense to rely on estimates of equilibrium exchange rates since, by construction, those reflect the

most likely outcomes of the currency floating process, once overshooting effects have vanished.

Table 5: Hypotheses for post-euro currency movements

Source: iAGS (2015) and authors' computations

Country	Exchange rate adjustment
Belgium	−17%
Germany	+14%
Ireland	−6%
Greece	−38%
Spain	−10%
France	−11%
Italy	+1%
Luxembourg	+14%
Netherlands	+15%
Austria	+15%
Portugal	−14%
Finland	−18%

Table 5 presents the exchange rate adjustment hypotheses upon which our risk assessment is based. The numbers are derived from the analysis of the internal and external imbalances of the eurozone presented in iAGS (2015, pp. 96-101). Following a fundamental equilibrium exchange rate (FEER) approach[8], these estimates correspond to the required value added price adjustments within the eurozone if countries are to reach both their external equilibrium (a current account that stabilizes the international investment position) and their internal one (closed output gaps). But those adjustments within the EMU can also be reinterpreted as exchange rate adjustments in a floating regime (under the hypothesis of fixed internal value added prices).

The numbers that we report in Table 5 correspond to the adjustments *relative to the euro area weighted average*. As a consequence, this means that the numbers can be used for the two scenarios that we analyze in this paper: in the case of a single country exiting the EMU (in which case the number corresponds to the expected movement of the new currency relatively to the euro), and in the case of the complete break-up.[9]

---

8   The methodology used in iAGS (2015) for computing FEERs bears some resemblance to Jeong *et al.* (2010). The exports and imports volume and price equations are very similar. There are however important differences. First, the current account objectives differ: in iAGS (2015), the objective is the current account that stabilizes the net international investment position at a 20 years horizon above a threshold of −35% of GDP. Second, these estimates do not rely on national models for European countries, but instead on a multinational model that includes the 11 largest countries of the euro area. Finally, the rest of the world is not disaggregated and is considered as one block.

9   In the complete break-up case, we are implicitly assuming that the the currency composition of the post-euro balance sheets will reflect the weights of eurozone countries (*i.e.* that the foreign currency components of the balance sheets of all countries will consist of 30% of Deutschmarks, 22% of French

According to these estimates, Greece still needs a very significant depreciation since the observed current account improvement is mostly artificial, relying on internal demand compression and underutilization of the productive potential. Other southern countries (Spain and Portugal) as well as France need a milder devaluation, while Germany, the Netherlands and Austria should undergo an appreciation. More surprisingly, Italy is neither undervalued nor overvalued with this methodology, owing to the fact that its structural current account is close to equilibrium and that its net international investment position is only mildly negative.

The adjustments presented above correspond to the misalignments before the euro exit. But one could argue that inflation rates could diverge following the exit, therefore creating an additional exchange rate drift over time. We however do not include this dimension in our computations, because our baseline scenario is that, after the shaky period of the break-up, a new monetary arrangement would be found that would include exchange rate targets. Moreover, it should be noted that a break-up could actually induce a convergence rather than a divergence of inflation rates: there is currently a substantial heterogeneity of inflation rates across eurozone countries, precisely because there is a single monetary policy that does not fit all.

One could also argue that the adjustments presented here correspond to long term targets, and that there may be overshooting which is not taken into account. Since it is very difficult to quantify the risk of overshooting and to forecast the dynamic path of the exchange rate adjustment, our strategy instead consists in overweighting the short term debt component in our risk analysis, as explained below.

Multiplying the exchange rate adjustments with the estimates of the relevant debt (or net position), one obtains the expected aggregate balance sheet movements after the euro exit.

For each of the three indicators, and for each of the sectors under consideration (public, financial corporations, non-financial corporations), we construct a qualitative risk measure based on thresholds. For the short term debt, the risk is considered to be high (resp. medium, low) if the expected post-euro increase is more than 2% of GDP (resp. 1%, 0%). And of course there is no risk if the short term debt decreases after the exit (case of an appreciation).

Similarly, the thresholds for the movements in total relevant debt are the following: high risk above 10% of GDP; medium risk between 5% and 10%; low risk between 0% and

---

Francs, 16% of Italian Lira...). This is of course a simplifying assumption, but we do not have enough data to refine this computation. Moreover, for the two scenarios, we are also making the assumption that the non-euro currencies (US dollar, UK pound, yen...) do not move relatively to the euro (or relatively to the weighted average of the new currencies in the break-up case).

5% (and no risk if appreciation). The thresholds for the relevant net position are the same as for the total debt movements, but with the opposite signs.

Table 6: Composite risk index (Q3 2015)

Source: authors' computations

	General government + central bank	Financial corporations	Non-financial corps. + households
Austria	No risk	Low risk	Low risk
Belgium	Low risk	No risk	Low risk
Finland	No risk	Medium risk	Low risk
France	No risk	No risk	Low risk
Germany	No risk	Low risk	Low risk
Greece	High risk	High risk	Low risk
Ireland	Low risk	High risk	Medium risk
Italy	No risk	Low risk	No risk
Luxembourg	Low risk	High risk	High risk
Netherlands	No risk	No risk	Low risk
Portugal	Medium risk	Low risk	Low risk
Spain	Low risk	Low risk	Low risk

Legend:	No risk	Medium risk
	Low risk	High risk

Finally, we construct what is essentially the average risk measure across the three indicators (see appendix 10.3 for more details). The results are shown in Table 6, which should be considered as a qualitative summary of the material presented in this paper.

The table highlights five sectors whose balance sheet will suffer from a strong negative impact in case of a euro exit: Greece's public sector, for which a large debt restructuring seems inevitable; the financial sectors of Greece, Ireland and Luxembourg; and the non-financial sector of Luxembourg. Serial defaults and bankruptcies are highly probable in those sectors, and strong policy action is called for (see next section).

Three other sectors are also at significant risk, though at a slightly lesser level: Portugal's public sector, which would probably have to default on its EFSF/EFSM loans; Finland's financial sector; and Ireland non-financial sector.

It should be noted here that the assessed risk levels of Ireland's and Luxembourg's non-financial sector may be exaggerated due to the data limitations discussed in section 4: cross-border loans of non-banking financial corporations are attributed to the non-

financial sector, and this may bias the risk upward given the high financialization of these countries.

The most striking result of our analysis is that the risk for the non-financial private sector is low for most countries (and maybe even for all of them given the last remark). There will therefore be a negative aggregate impact on balance sheets for productive firms and for households, but it should be of a size small enough to be manageable without significant disruptions, assuming that the appropriate policy measures are put in place.

The case of Italy is a bit special: since our estimate for the expected exchange rate movement is almost zero (see Table 5), our risk index indicates no risk at all, by construction. If one instead assumes a 15% depreciation of the new Lira, then the risk level becomes "low" for all three sectors (same as Spain).

7. Policy recommendations

In this section, we discuss the policy measures that could be implemented to limit the balance sheet risks posed by a euro exit, both from an *ex ante* and an *ex post* perspective. Of course we do not claim to provide a definitive and detailed guide to solving all the problems posed by this issue, independently of the country and sector. We rather provide an outline of relevant policy orientations, which will have to be translated into practical measures tailored to the specific situation at hand.

7.1. *Ex ante* limitation of exposure

Given the mounting uncertainty over the viability of the EMU, it may be wise planning to limit the exposure of agents to financial assets and liabilities that, despite being denominated in euros, present a currency risk in case of a break up.

It is interesting to note that, to some extent, the eurozone crisis has endogenously produced such a diminishing of risk exposure by reducing cross border liabilities (ECB, 2016, graph S23-S27). Since net financial flows coming from the core have diminished, this mechanically translates into a reduction (or at least a limitation) of the balance sheet at risk, both from the perspective of core and periphery countries.

The first best solution for further diminishing cross-country exposures would be a rebalancing of trade and financial flows within the EMU. Indeed, external imbalances today remain at very high levels, with core countries displaying very large current account surpluses. The deficits of periphery countries have admittedly shrunk, but this is largely the consequence of deflationary policies that have slashed internal demand; the problem is thus largely unsolved, since demand—and external deficits—will rise again if these countries are finally given a chance to recover. The right solution to this issue

would consist in implementing reflationary policies in Germany (and other core countries), in order to reduce the competitiveness differential between core and periphery, without imposing destructive austerity policies in the periphery. But such a strategy would take time to bear fruit, and is anyways unlikely to materialize given the political equilibria at the scale of the continent (Lapavitsas and Flassbeck, 2015).

Another risk mitigation policy would consist in discouraging the exposure of firms to international debt markets and foreign banks, and symmetrically in encouraging domestic savers to buy domestic securities. For a given level of external imbalances, such a move does not have the potential to alter the relevant net position, but it can diminish gross positions and in particular the relevant debt levels. However, this strategy amounts to a deliberate increase in the fragmentation of financial markets within the eurozone, and is therefore somewhat contradictory with the purpose of a single currency, as it implies some restrictions on capital movements.

A last strategy, of an uncooperative nature, would be to alter the governing law of financial assets, without changing the net nor the gross financial ties between countries. Concretely, for a government or a corporation of the periphery, this means emitting bonds under domestic law instead of foreign law. Or for a bank of the periphery, to attract deposits from households of the core, instead of borrowing on the interbank market from banks of the core. In both cases, some higher interest rates would have to be paid to compensate for the devaluation risk. However, as the example of the Greek restructuring showed, changes in governing law tend to go in the opposite direction, in order to increase investors protection against sovereign risk.

7.2. *Ex post* impact limitation

The moment a country decides that the euro is no longer its official currency, the redenomination process starts. It is crucial for this process to be as fast as possible, in order to minimize the uncertainty in the economy. A clearly defined legal framework is crucial, because it diminishes the number of cases that will have to be settled by a court. In particular, in the case of a complete euro break up, a European Union directive should ideally be passed to facilitate the settling of complex cases, possibly through the introduction of a new accounting currency similar to the former ECU[10]; see Nordvig and Firoozye (2012) for a thorough review of these legal dimensions.

The next challenge is for the country to stabilize the exchange rate of the new currency, and to avoid any overshooting, *i.e.* a depreciation (or appreciation) beyond what is required for the long term external equilibrium. As shown by Cavallo *et al.* (2005), there is a significant risk of overshooting for countries abandoning a fixed exchange rate

---

10 As long as the United Kingdom remains in the European Union, such a directive can also help with the redenomination of English law contracts and bonds. However, the pending Brexit will soon undermine this possibility.

regime, especially if their level of external debt is high. In order to avoid or to limit as much as possible this risk, the central bank should announce its new parity objective and its willingness to defend it. This will of course be easier to achieve if there are cooperative arrangements with other central banks (the ECB or the national central banks). It may also be necessary to introduce temporary capital controls for limiting speculative movements and capital flights.

Even if the exchange rate is kept under reasonable control, some economic agents will come under liquidity stress due to higher short term debt repayments, because their access to external finance is cut due to their balance sheet degradation, or because the financial system itself is in crisis. Continuity of access to liquidity should be ensured by pursuing an expansive monetary policy (though that may potentially conflict with the exchange rate objective for periphery countries). Moreover the domestic banking system could be compelled to fund to some extent public finances. Ensuring liquidity access for non-financial corporations is the most critical point. Part of the task can be done through the usual transmission channel, that is the banking system. But even in the context of monetary easing, private banks may be reluctant to lend to domestic firms which have a degraded balance sheet. Public intervention is therefore warranted, either in the form of some incentive mechanism to ensure that banks lend adequately, or by mobilizing public investment banks and giving them special directives for organizing an emergency lending to firms negatively affected by the new exchange rate. In particular, firms importing crucial inputs should be given a priority access to hard foreign currencies.

It may also happen that the financial system itself be in trouble due to its own balance sheet problems, in which case liquidity access could be endangered for the whole economy, and not only those firms directly affected by the new external conditions. Failed banks should in that case be quickly restructured: either by splitting them along a good bank / bad scheme if possible, otherwise by nationalizing them, in which case that could facilitate the providing of emergency liquidity to the rest of the economy.

If liquidity is the short term priority, solvency problems have to be dealt with in the longer run. We have already briefly discussed the case of failed banks. For governments (most likely Greece and Portugal according to our analysis), a debt restructuring process seems to be the only option. The negotiation with creditors (which are essentially European states and institutions) can create the opportunity to ask for a monetary cooperation agreement, in exchange for a partial reimbursement; in the worst case, an outright default is always possible, though that means relying on domestic financing for some time, typically two years (Gelos *et al.*, 2011).

For non-financial corporations, default can be an option in some cases. But most often, it should better be avoided, especially for exporting firms, which could face retaliation on foreign markets (and firms exposed to foreign currency risks tend to be precisely those

which are internationalized). We have seen that, on aggregate, the balance sheet risk is relatively low for the non-financial sector: this means that a number of firms should be able to absorb the shock without help. Moreover, as shown by our net positions calculations (Table 4 and Figure 9), there is room for redistribution in periphery countries (except Spain) between winners and losers; that may however turn out to be difficult to implement in practice. Another possibility for the most strategic sectors is to have a direct injection of public capital; incidentally, this offers an opportunity for industrial policy.

In core countries (Germany, the Netherlands, Austria), though there is no debt issue, the aggregate net position of the non-financial private sector will deteriorate, because there is a large stock of foreign assets. This problem most likely concerns households (possibly through pension and mutual funds), so one could worry about the negative impact on consumption via the wealth effect (though our data are insufficient to validate that hypothesis). This calls for a government spending and investment plan, which is anyways needed in those countries to absorb their excess savings.

8. Conclusion

This paper has tried to assess the balance sheet effects of a hypothetical euro exit, looking at the twelve historical members of the eurozone, both from an aggregate and sectoral perspective.

The broad conclusion that we draw from this analysis is that, even though the problem of balance sheets is real and should be taken seriously, its order of magnitude is not as large as some claim. Especially in the non-financial private sector, the issue should be manageable provided that proper policy measures are implemented, and disruptions should in that case be limited.

We have however identified a few specific vulnerabilities: the public debts of Greece and Portugal, for which a substantial restructuring or even a default would be the likely outcome; the financial sectors of Greece, Ireland, Luxembourg, and potentially Finland, which would have to undergo a deep restructuring; and potentially the non-financial sector of Ireland and Luxembourg, though that latter result may be an artifact caused by our data limitations.

Assessing the costs of a euro exit obviously matters for properly dealing *ex post* with the event, if it were to materialize because of some unexpected political or economic shock. But this assessment is also interesting from an *ex ante* perspective, especially for a country which is considering whether to leave or to stay and is performing a cost-benefit analysis. From that perspective, it is important to remember that, for periphery countries, staying in the eurozone also leads to a negative balance sheet effect, because

of the debt deflation strategy imposed by creditors. This is most evident in the case of Greece, whose public debt to GDP ratio continues to rise through the denominator effect, as growth and inflation head down.

Even though this study has shed light on some critical dimensions of the issue at stake, more work could be done to refine the analysis. In particular, we did not perform an estimation of the cross-country spillover effects of possible defaults; this is however made difficult by the large uncertainty that surrounds the policy implemented after the exit. Another critical dimension still to be investigated is the risk heterogeneity within sectors: even if the net sectoral balance sheet effect is small, are relevant assets detained by the same agents as relevant liabilities? The answer to this question significantly affects the relevant policy responses.

9. Bibliography

Amiel, D., Hyppolite, P.-A. (2015). Is there an easy way out? Private marketable debt and its implications for a Euro breakup: the case of France. Cahier no. 2015-02, École Polytechnique.

Bebczuk, R.N., Panizza, U., Galindo, A. (2006). An Evaluation of the Contractionary Devaluation Hypothesis. Research Department Publications No. 4486, Inter-American Development Bank.

Bleakley, H., Cowan, K. (2008). Corporate Dollar Debt and Depreciations: Much Ado About Nothing? The Review of Economics and Statistics 90, 612–626.

Cavallo, M., Kisselev, K., Perri, F., Roubini, N. (2005). Exchange rate overshooting and the costs of floating. Working Paper Series No. 2005-07, Federal Reserve Bank of San Francisco.

Cecchetti, S., McCauley, R., McGuire, P. (2012). Interpreting TARGET2 balances. BIS Working Paper No. 393. Bank for International Settlements.

ECB (2016), Financial Integration report 2016,
https://www.ecb.europa.eu/pub/pdf/other/financialintegrationineurope201604.en.pdf

Frankel, J. (2005). Mundell-Fleming Lecture: Contractionary Currency Crashes in Developing Countries. IMF Staff Papers 52, 149–192.

Gelos, R.G., Sahay, R., Sandleris, G. (2011). Sovereign borrowing by developing countries: What determines market access?, Journal of International Economics 83, 243–254.

Gruić, B., Wooldridge, P. (2012). Enhancements to the BIS debt securities statistics. BIS Quarterly Review, December, 63–76.

iAGS (2015). The independent Annual Growth Survey 2016: Give Recovery a Chance. OFCE-ECLM-IMK-AK. http://www.iags-project.org/documents/iags_report2016.pdf

Jeong, S.-E., Mazier, J., Saadaoui, J. (2010). Exchange Rate Misalignments at World and European Levels: a FEER Approach. International Economics 121, 25–58.

Lapavitsas, C., Flassbeck, H. (2015). Against the Troika: Crisis and Austerity in the Eurozone. Verso Books.

Nordvig, J., Firoozye, N. (2012). Rethinking the European monetary union. Wolfson Economics Prize 2012, final submission. http://jensnordvig.com/wp-content/uploads/2013/08/Rethinking-the-European-monetary-union.pdf

Proctor, C. (2011). The euro—fragmentation and the financial markets. Capital Markets Law Journal 6, 5–28.

Puppetto, L., Sode, A. (2012). Ajustement extérieur et effets de valorisation. Document de travail no. 2012/03, Direction générale du Trésor.

Stiglitz, J. (2016). The Euro and its Threat to the Future of Europe. Allen Lane.

Streeck, W. (2015). Why the Euro divides Europe. New Left Review 95

Towbin, P., Weber, S. (2013). Limits of floating exchange rates: The role of foreign currency debt and import structure. Journal of Development Economics 101, 179–194.

Whittaker, J. (2011). Eurosystem debts, Greece, and the role of banknotes. MPRA Paper 38406, University Library of Munich, Germany.

10. Appendix

10.1. Debts classified as foreign direct investment

Intra-company lending across borders is classified by statisticians as foreign direct investment. It corresponds to a situation where a parent company lends to or borrows from a subsidiary, or when a subsidiary lends to another one. Figure 10 presents the stocks of FDI debt and its decomposition depending on the direction of the intra-company financial flow.

Figure 10: Debts classified as FDI (% of GDP, Q3 2015)

Source: World Bank QEDS
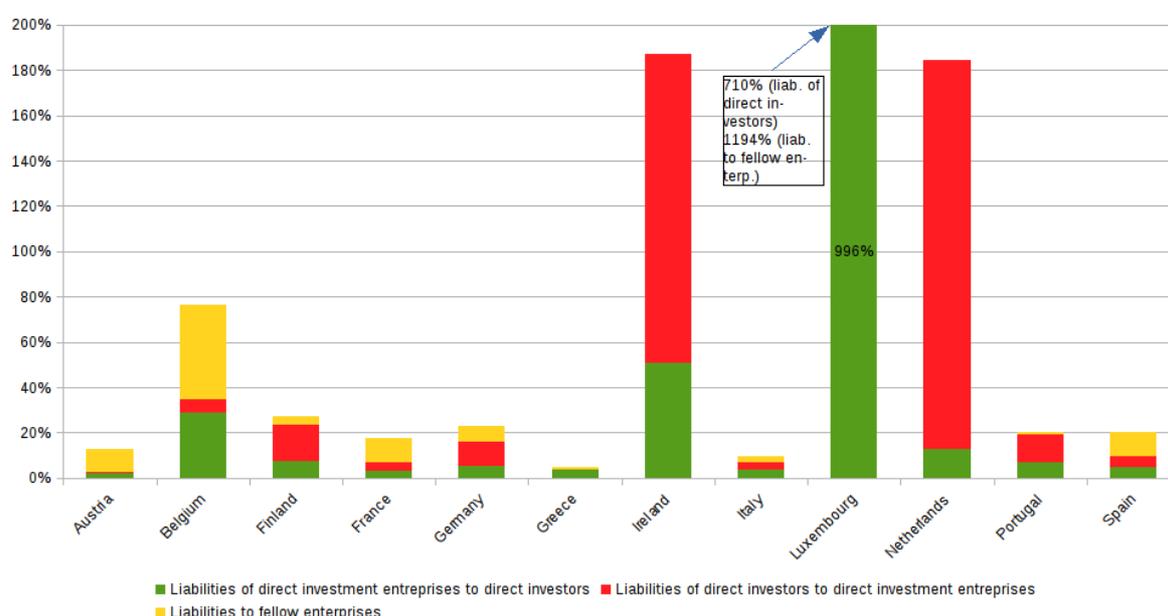
Outstanding amounts are very large for the usual outliers (Ireland, Netherlands, Luxembourg), and are typically between 10% and 20% of GDP for most countries.

We however do not include those amounts in our relevant debt measure (nor do we include them in our relevant net position, since we exclude FDI from it). The rationale is the following: an exchange rate movement affecting the currency in which the loan is denominated corresponds to an intra-company redistribution. We therefore make the assumption that such a shock will be easily absorbed by the company, if needed through a partial debt cancellation that neutralizes the effect of the currency move.

10.2. TARGET2 balances

Figure 11 presents the TARGET2 balances of the twelve countries as of Q3 2015. To put it simply, TARGET2 balances play the same role within the EMU as foreign exchange

Figure 11: TARGET2 balances (% of GDP, Q3 2015)

Source: ECB
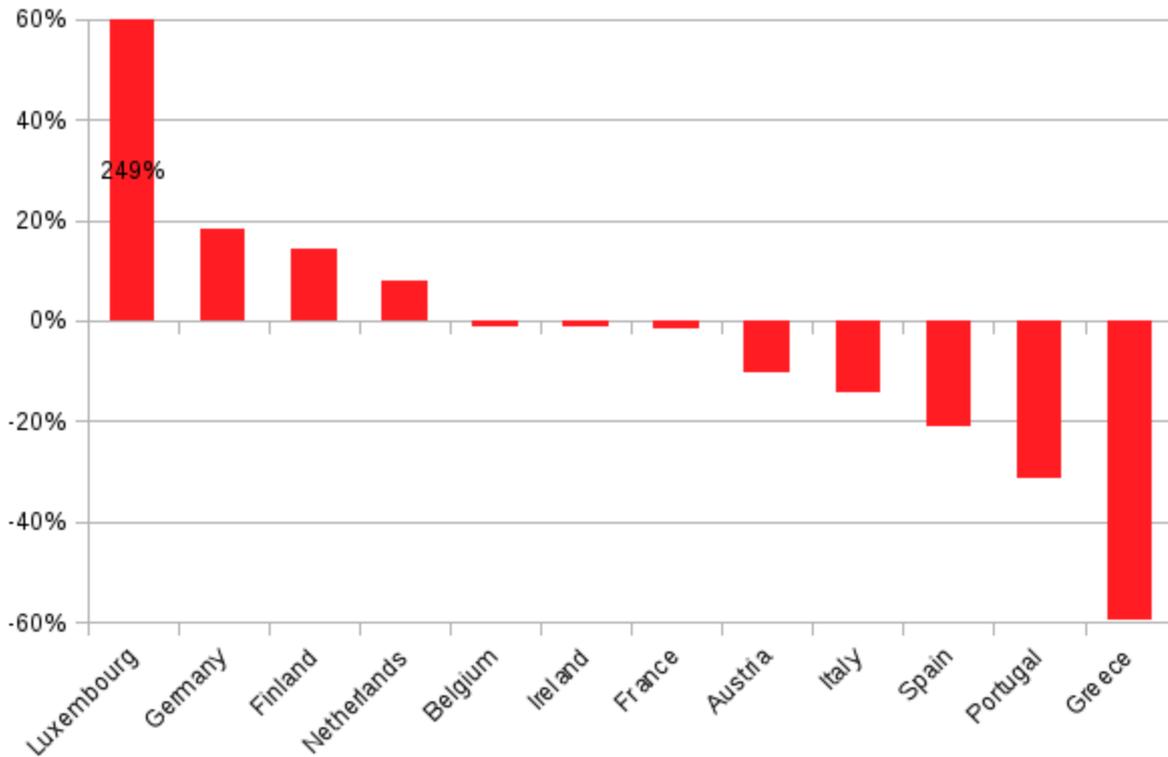
reserves play in a fixed exchange rate regime (Cecchetti *et al.*, 2012). They move every time a current account operation is not matched by a capital operation.

Technically, those balances represent a claim or a liability of national central banks on/to the Eurosystem as a whole.

In the case of Greece, the TARGET2 claim is more or less the counterparty of the Emergence Liquidity Assistance (ELA): since banks in other countries are not willing to lend to Greek banks to compensate for capital flights, the financing gap of the Greek banking system is filled through the intervention of the National Bank of Greece, which itself grows a liability to the ECB.

It is therefore clear that TARGET2 balances correspond to claims between sovereign states, that are distinct from official public debt figures. For example, if Greece were to leave the EMU, its TARGET2 liability would have to be settled with other eurozone countries, in addition to the existing bilateral, EFSF and ESM loans.

10.3. Risk index components

Table 7 presents the variation of total debt for each sector following the euro exit. It is the arithmetic product of the relevant debt (Table 3) with the (opposite of the) exchange rate variation (Table 5). A positive number therefore indicates an increase in total debt. Similarly, Table 8 indicates the variation of the short term component.

33

Table 7: Total debt variation following euro exit (% of GDP, Q3 2015)

Source: authors' calculations

	Central bank + government sector	Financial corporations	Non-financial corps. + households
Austria	−5,4%	−5,3%	−3,6%
Belgium	+1,6%	+3,7%	+3,7%
Finland	+3,1%	+10,9%	+3,7%
France	+0,3%	+4,7%	+3,7%
Germany	−0,8%	−3,8%	−2,7%
Greece	+54,1%	+16,2%	+5,1%
Ireland	+2,0%	+22,8%	+18,0%
Italy	−0,1%	−0,2%	−0,1%
Luxembourg	−0,9%	−118,5%	−123,0%
Netherlands	−0,7%	−33,0%	−9,7%
Portugal	+8,0%	+2,6%	+2,9%
Spain	+1,3%	+4,5%	+1,6%

Table 8: Short term debt variation following euro exit (% of GDP, Q3 2015)

Source: authors' calculations

	Central bank + government sector	Financial corporations	Non-financial corps. + households
Austria	−0,7%	−1,2%	−1,0%
Belgium	+0,3%	+0,2%	+2,1%
Finland	+1,1%	+3,2%	+0,8%
France	−0,0%	+0,9%	+2,0%
Germany	−0,2%	−1,2%	−0,7%
Greece	+1,3%	+11,0%	+1,9%
Ireland	+0,1%	+5,6%	+3,0%
Italy	−0,0%	−0,0%	−0,0%
Luxembourg	−0,0%	−18,2%	−52,1%
Netherlands	−0,3%	−5,3%	−2,6%
Portugal	+0,1%	+0,2%	+1,2%
Spain	−0,0%	+0,9%	+0,4%

Table 9 presents the variation of the total net worth for each sector following the euro exit. It is the arithmetic product of the relevant net position (Table 4) with the (opposite of the) exchange rate variation (Table 5). A positive number therefore indicates an improvement of the balance sheet.

Table 9: Net worth variation following euro exit (% of GDP, Q3 2015)

Source: authors' calculations

	Central bank + government sector	Financial corporations	Non-financial corps. + households
Austria	+3,0%	−6,3%	−6,5%
Belgium	+1,1%	+16,5%	+18,0%
Finland	+12,0%	+11,2%	+2,1%
France	+1,0%	+5,7%	+4,9%
Germany	−1,9%	−6,7%	−6,3%
Greece	−72,8%	+3,7%	+12,3%
Ireland	−1,7%	+11,8%	+24,7%
Italy	+0,0%	+0,0%	−0,2%
Luxembourg	−13,6%	−181,0%	−725,4%
Netherlands	−2,4%	−4,6%	−5,1%
Portugal	−7,2%	+3,9%	+3,2%
Spain	−1,8%	+1,6%	−0,8%

For each country and sector, a total score is attributed on the basis of these figures. It is constructed by summing the three per-component scores:

- for the variation of total debt: 0 point if negative variation; 1 point between 0% and 5%; 2 points between 5% and 10%; 3 points between 10% and 25%; 4 points between 25% and 50%; 5 points above 50%;

- for the variation of short term debt: 0 point if negative variation; 1 point between 0% and 1%; 2 points between 1% and 2%; 3 points between 2% and 3%; 4 points between 3% and 4%; 5 points between 4% and 5%; 6 points above 5%;

- for the variation of net worth: −2 point if variation above 10%; −1 point between 5% and 10%; 0 point between 0% and 5%; 1 point between −5% and 0%; 2 points between −10% and −5%; 3 points between −25% and −10%; 4 points between −50% and −25%; 5 points below −50%.

Note that there are negative scores for the net worth variation if it is positive and above 5% of GDP: the idea is to take into account the mitigation potential of assets when there is a debt problem.

The total score is then translated into a qualitative risk measure:

- no risk if score equal to or below 1;

- low risk if score equal to 2 or 3;

- medium risk if score equal to 4 or 5;

- high risk if score equal to or above 6.