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How Aid Supply Responds to Economic Crises

A Panel VAR Approach

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Abstract

The strong interdependence between the developed and developing worlds surfaced with the recent economic downturn. Due to the global character of the economy, the downturn affected not only the North but also the South. In addition, the Official Development Assistance (ODA) is subject to a pro-cyclical trend in aid which falls when donors encounter recession. We attempt to answer the question of whether and how donors adjust aid budgets in response to various macroeconomic shocks. The main objective of the study is to explore the channels as well as behavioural consequences of unexpected financial shocks on aid budget adjustments in the short run. Crises are found to affect aid budgets and their trend through two channels: directly through lower revenues and indirectly by increasing fiscal costs through exchange rates and financial volatility. In addition, this relationship between aid and the donor economy is not solely economic as the donor's internal political orientation also plays an important role.

Keywords: financial crisis, aid, donors, panel VAR
JEL classification: C33, F35, G01, O11

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1 Introduction

The financial crisis of the late 2000s, that followed the collapse of the housing bubble and led to a liquidity shortfall in the US banking system, spilled all over the world. Due to the global character of the economy, the crisis affected not only the North but also the South. The decline in economic activity between 2007 and 2009 lowered the economic growth of numerous developing countries on all continents. This effect is attributable to the drop in trade volume, export prices, commodity prices, investment and remittances from migrant workers. Consequently, the financial crisis led to a dramatic rise in the number of households living below the poverty line (te Velde 2009). In parallel, the alarming presence of simultaneous and interconnected crises in climate change (IPCC 2007) and food provision, with deteriorating effects on global wealth is to be noted, as Addison et al. (2010) underline, calling the phenomenon the *triple crisis*. Bloem at al. (2010) render the three interlaced crises in the light of malnutrition. With the financial crisis having both contracted economic performance and increased food prices, climate change is expected to further confront the South with overwhelming challenges (Stern 2007; Eriksen et al. 2007; UNFCCC 2007), deepening the food crisis (Schmidhuber and Tubiello 2007) and amplifying the incidence of natural disasters and health issues (Jones et al. 2008). In the presence of crisis, developing countries rely crucially on aid, while developed countries reduce aid volumes, a conflictual situation that gives rise to a discussion on the under-provision of aid by donors. We attempt to answer the question of whether and how donors adjust aid budgets in response to various macroeconomic shocks.

At the global level, the crisis affects stability, peace, wealth and many other important global public goods (Kanbur 2001; Reisen et al. 2004; Samuelson 1954), and as such calls for attention and action at the international level (Stiglitz 1995, 2006).

The strong interdependence between the developed and developing worlds surfaced during the recent economic downturn. Global economic stability was affected, as the financial crisis in the developed economies negatively influenced the developing world. With developing countries facing further challenges, including food undersupply and climate change, it becomes evident that the under-provision of Official Development Assistance (ODA) in developing countries may have serious adverse effects.

Indeed, ODA, despite being criticized as ineffective, remains a major element in the budget of many developing countries, and has since the 1960s (World Bank 2001a; te Velde 2002; Samuelson 2000), and is found to have a positive effect on growth (Arndt et al. 2010, 2011). Nevertheless, conventional bilateral aid faces a pro-cyclical trend in aid (Arellano et al. 2009), which falls when the donors encounter recession. This situation leads to a conflict: in the presence of crises, developing countries rely even more on aid (Brautigam 2000), while developed countries reduce aid volumes (Addison et al. 2010). This vicious circle is not theoretical, but is at the heart of the current crisis, and raises important questions. Will the North manage to respond to the growing need for aid? Will donors decrease their disbursements? How will different sectors of aid be affected?

This study focuses on the influence of economic crises on aid supply from the major ODA donor countries. The research question that ought to be addressed is: *how does the financial crisis influence aid flows?* This project seeks to answer this question from a donor-centred frame of reference. In particular, which shocks matter: those linked to financial variables, to political preferences or to social needs? Do donors adjust aid budgets in response to those unexpected macroeconomic shocks? What are the dynamics of the response of aid?

The main objective of the research is to explore the channels and behavioural consequences of unexpected financial shocks on aid budgets. We show the effects of shocks on a set of macroeconomic variables on aid in 23 ODA donor countries. For this we use panel vector autoregression (PVAR) analysis and examine orthogonalized impulse response functions, coefficients and variance decompositions.

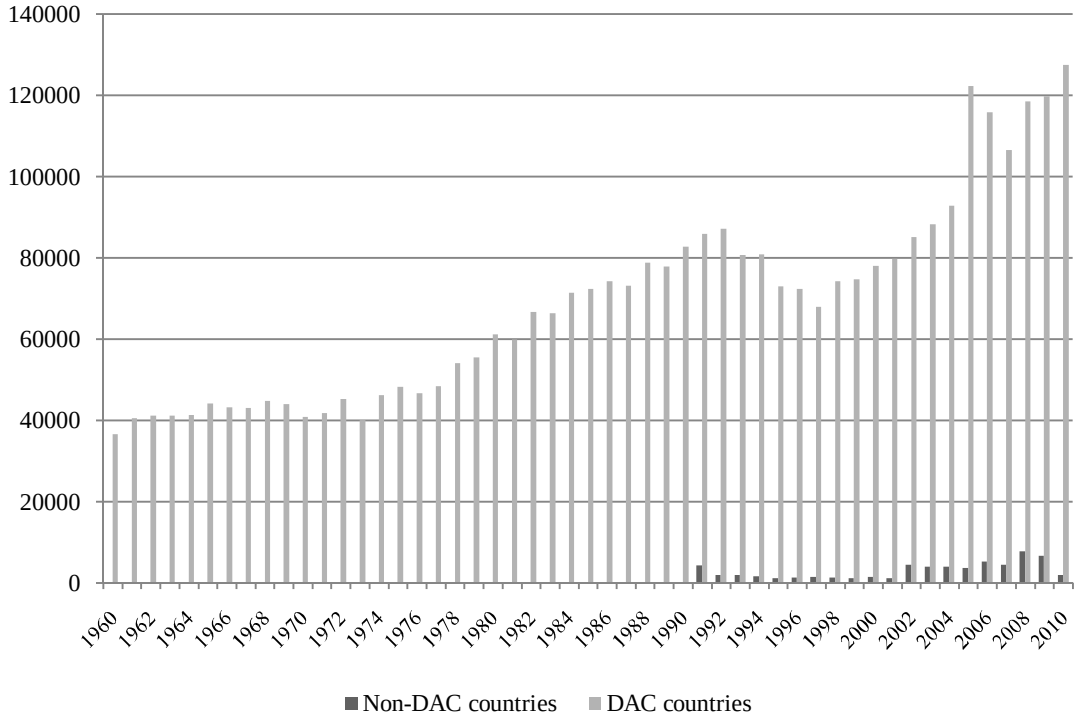
Country-level data are used to study the dynamic relationship between donors' financial and economic conditions and aid disbursements. Our main interest is to determine whether the dynamics of aid differ during crises of different magnitudes, or before and after the downturns. It is also in our interest to determine if the relationship is of purely economic nature, or if it is influenced by politics as well. We approach the problem from the donor's standpoint, which remains relatively unexplored, and build on an existing body of literature on aid, growth and aid supply, as well as contribute to the field in several ways. We propose a simple theoretical consumption model to capture donors' decisions on aid disbursements versus internal country needs. Using vector autoregressions on panel data we consider the complex relationship between a country's financial situation and aid provision, while controlling for country-specific unobserved heterogeneity (i.e. fixed effects). By analyzing orthogonalized impulse-response functions, we are able to distinguish the response of ODA to shocks coming through various channels transmitting financial and economic crises. The work also aims to contribute to the discussion on aid supply during unexpected, worldwide economic downturns.

1.1 Aid

Most of the literature addresses the issue of aid from the standpoint of the recipients rather than the donors (Easterly 2003; Hansen and Tarp 2001). There exist studies on the donors' motivations to provide aid (political influences, poverty reduction) (Alesina 2000), as well as some recent studies on the determinants of aid supply. The extensive corpus of literature available on aid and growth in recipient countries gives some insights in to the instruments of aid.

Overall, aid is currently about 70 per cent bilateral, directly from the donor country to the recipient, and 30 per cent multilateral, transferred through international organizations such as the World Bank or the United Nations (OECD-DAC database). Nearly 85 per cent of developmental aid comes from government sources as official development assistance (ODA); the remaining 15 per cent flows from non-governmental sources (OECD-DAC database, Official and Private Flows). There is a growing discussion about emerging donors, like China, Brazil or Russia (McCormick 2008; Woods 2008); however the majority of aid still originates from the traditional ODA donors of the Development Assistance Committee (DAC) (see Figure 1).

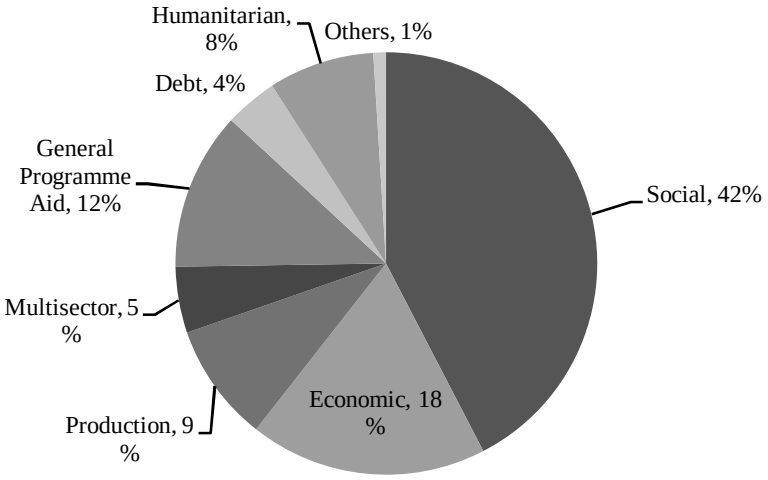
Figure 1: Net ODA disbursements



Note: Net ODA disbursements in USD millions, constant 2009.
Source: Author's illustration based on data from OECD Database on Aid from Development Assistance Committee Members.

Development aid has always been a marginal fraction of donors' GDP, between 0.1 per cent and 1 per cent; however, it constitutes a large share of the GDP of several developing countries. World Bank records indicate that it constituted 70 per cent of the GNI of Liberia in 2009, 21 per cent of the GNI in Mozambique, and 18 per cent in Togo. Africa and Asia are the two main regions receiving aid, accounting for 38 per cent and 30 per cent respectively of the total ODA received worldwide (OECD-DAC 2009). The sectorial allocation of aid evolved over the last 50 years and currently most development assistance is allocated into social and economic sectors (see Figure 2). Therefore, decreases in aid following donors' economic woes may significantly deteriorate the living conditions in recipient countries.

Figure 2: ODA to Africa by sector



Source: Author's illustration based on data from OECD-DAC database, commitments 2009.

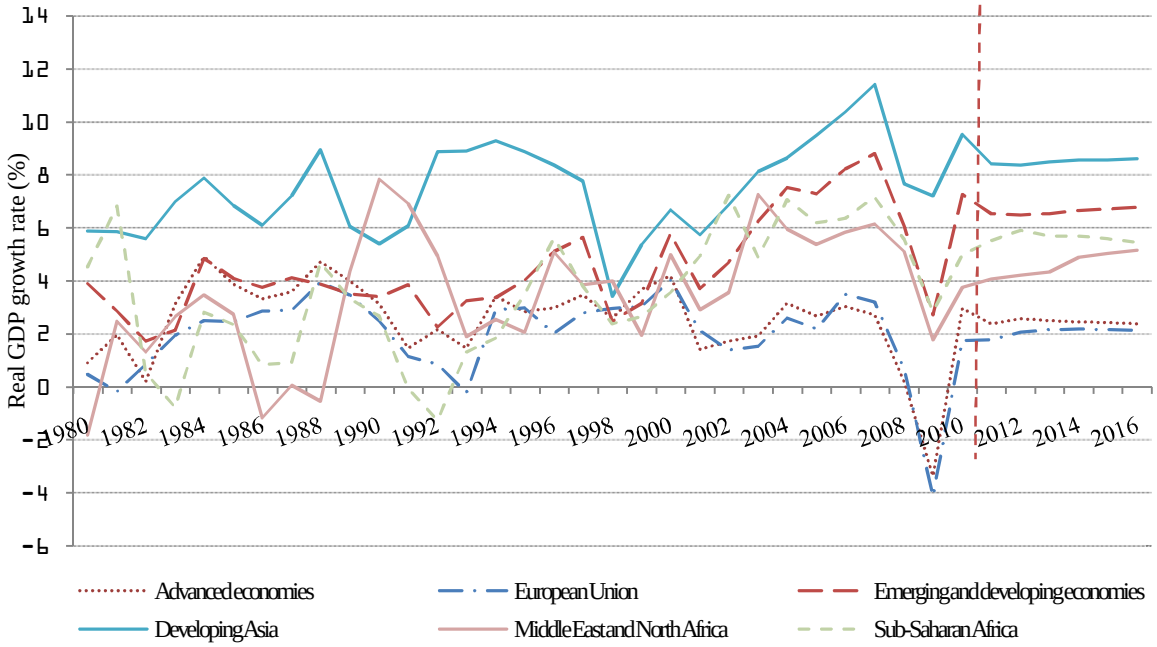
In the last years, the trajectory of aid has remained constantly, significantly below the target agreed by donors of 0.7 per cent ODA to GNI by 2015. Indeed, ODA to GNI for all DAC donors was just 0.32 per cent in 2010 (Figure 4).

1.2 Financial crisis and aid

The financial crisis of the late 2000s has two distinguishing features. First, it was unexpected and incorrectly predicted by the OECD and the IMF. The second unprecedented feature of this crisis is that its effects were truly global, as all regions of the world have been affected. Even simple evidence such as the correlation of GDP growth rates between major regions of the world reveals how coordinated the recent crisis was (Figure 3). Real GDP growth rates fall sharply during the 2007 and 2008 crisis outbreak, and most advanced economies record negative growth rates. Originating in the US, the crisis rapidly develops and spreads into a global economic shock, resulting in a number of not only American but also European bank failures. Governments pour billions of dollars and Euros into their banking systems.

During the second phase of the crisis, in 2010 and 2011, many European economies experience debt crisis, budget cuts, and massive job losses. Entire countries are in danger of bankruptcy, including Iceland, Greece, Spain, Portugal and Italy. From the North, the crisis has a spillover effect on the developing South through various channels including reduced demand, declining investments, lower remittances, declining exports and lower prices for imports from the South (Addison et al. 2010). Yet, evidence flourishes in the literature for cyclical co-movement in output, investments and consumption among_industrialized, and recently, among developing economies (Kose et al. 2004; Prasad 2003). Globalization has opened new channels for the transmission of shocks.

Figure 3: Real GDP growth in the world (1980-2016)



Source: Author's illustration based on data from IMF World Economic Outlook (WEO) database, April 2011.

Although the crisis began among the richest nations, concerns for the financial security of the poor are justified. The developed world is expected to prioritize its own economic situation, and it would not come as a surprise if donor countries identified development aid as an unproductive spending of their budgets, and decided to cut it.

There is a widespread concern that ODA will suffer from cuts due to revenue shortfalls resulting from both lower growth and higher expenditures to support financial sector and to stabilize the economy (Hallet 2009). The discussion is actively developing in the literature, appraising whether donors will reduce aid when recipients need it even more. In a discussion about financial crisis and aid disbursements, Roodman (2008) concludes that based on the historic evidence of the Finnish 1990s crisis aid disbursements are likely to decline. This effect, of a donor economic downturn reducing aid expenditure, is also confirmed by Frot (2009), who finds GDP shocks in donor countries to have significant and deteriorating effects on aid, and Dang et al. (2009), who observe a 20-25 per cent decline in ODA from donors who experienced the banking crisis. Indeed, declining aid flows are an expected consequence of recessions. If the donors' GDPs fall they are likely to provide less aid in monetary terms, as reductions will occur.

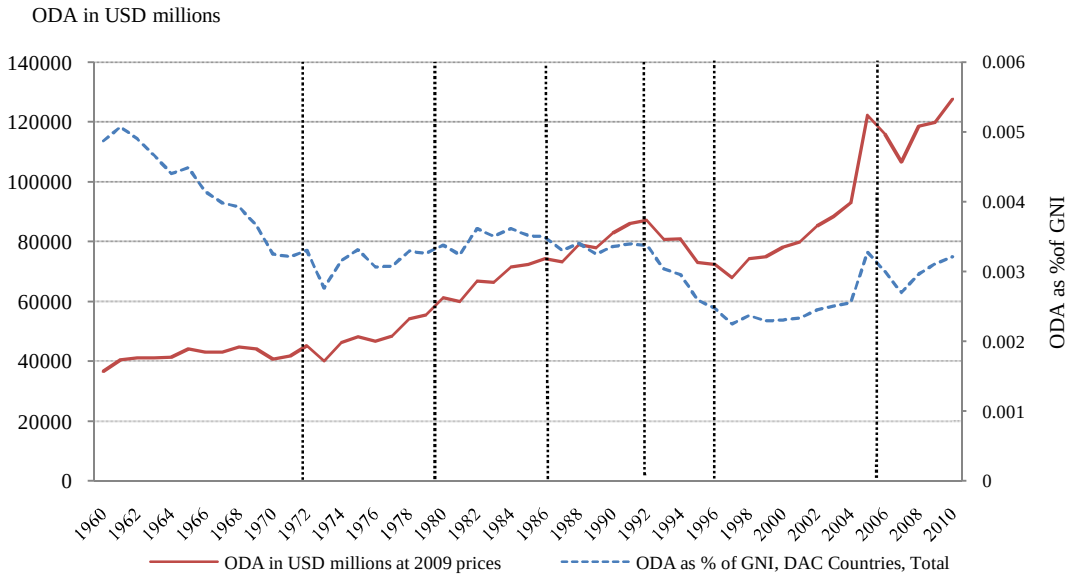
There is less evidence of the impact of economic crises on donors' budgetary aid. Some studies suggest that crises may not imply reductions in a donor's share of GDP devoted to aid (Pallage and Robe 2001). Mold et al. (2010) argue that aid is not sensitive to recessions and is not correlated with GDP growth. Dabla-Norris et al. (2010) discuss the link between donor-recipient cycles[1] and aid flows. They conclude that development aid is pro-cyclical with respect to both the output cycles of the donor and of the recipient. Donors will raise their aid disbursements

[1] For a literature review on business cycle and aid see Hallet (2009).

during economic expansions and decrease it during recessions, while recipients get more aid if their economic conditions are good. Therefore aid is not working as insurance in aid-receiving countries.

Figure 4 presents the ODA pattern from both perspectives: as a percentage of gross national income (GNI) and in real terms. Between 1960 and 1990, ODA flows from Development Assistance Committee (DAC) countries to developing countries rise steadily, while the total ODA as a share of GNI aggregate in DAC countries shows a decreasing trend up to the 1970s, from when it oscillates between 0.27 per cent and 0.36 per cent. In the mid-1990s, an *aid fatigue* occurs (Gibbon 1993). The ODA flows fall by 16 per cent in real terms due to the fiscal consolidation happening in donor countries after the recession, the donors' perception of aid as ineffective, and the end of the Cold War (Boschini and Olofsgard 2007). The ODA starts rising again in real term in 1998. More recently, several international meetings have encouraged ODA outflows, including the International Conference on Financing for Development (Mexico, 2002) and the UN Millennium + 5 Summits (2005). Aid peaks in 2005-06, corresponding to large debt relief operations in Iraq and Nigeria. ODA flows experience a decline in 2007 because of the financial crisis, but continue to rise. In 2010 they reach their highest real level ever, at USD 129 billion.

Figure 4: Financial crises and pro-cyclical ODA outflows trend following ups and downs of donors' economies



Source: Author's illustration based on data from OECD-DAC database.

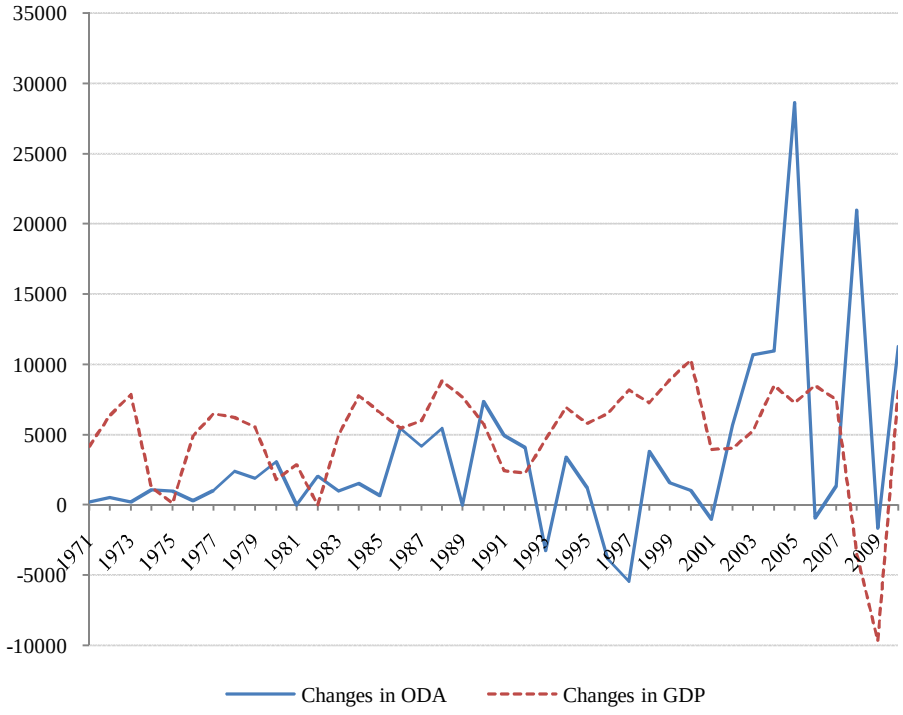
Historical evidence of the decrease in ODA provision during crises is marked with vertical lines. Major reductions in aid flows occur as a consequence of economic downturns in 1973 and 1979 (oil crises), 1987 (Black Monday), 1992–93 (Black Wednesday), 1997–98 (Asian Financial Crisis), 2007–10 (financial crisis followed by the late 2000s recession and the 2010 European

sovereign debt crisis). It supports the pro-cyclicality hypothesis that as donors go through economic recessions, their GDP falls and they provide less aid.

Two large declines in the aid to GNI ratio occurred in 1990-96 and 2005, preceding the Asian crisis of 1997 and the financial crisis of 2008 respectively. The former happened because DAC donors were not seriously affected by the Asian crisis and the latter reflects a one-time large debt relief operation to Iraq, Afghanistan, Democratic Republic of Congo and Nigeria driven by the U.S. (Radelet et al. 2008). The 2004 spike in aid is artificial and the apparent subsequent reduction in aid afterwards is an artefact corresponding to the return of aid to its average level.[2]

Another noteworthy issue illustrated in Figure 5 is the evidence indicating that the volatility of foreign aid has increased in recent years, starting in the early 2000s.[3] Fielding and Mavrotas (2011) find that programme aid tends to be more volatile than project assistance, which makes sense, since programme aid as a part of budget support is often used as a policy conditionality tool and is easier and more likely to be suspended. The *unpredictability of aid disbursements*, referred to by Bulir and Hamann (2008), together with the *pro-cyclical* nature of capital flows, have become a concern. These patterns are usually associated with adverse economic consequences for developing countries which undermine the positive impacts of foreign inflows.

Figure 5: First differences in net ODA and GDP



Note: ODA and GDP shown in USD millions, constant 2009.

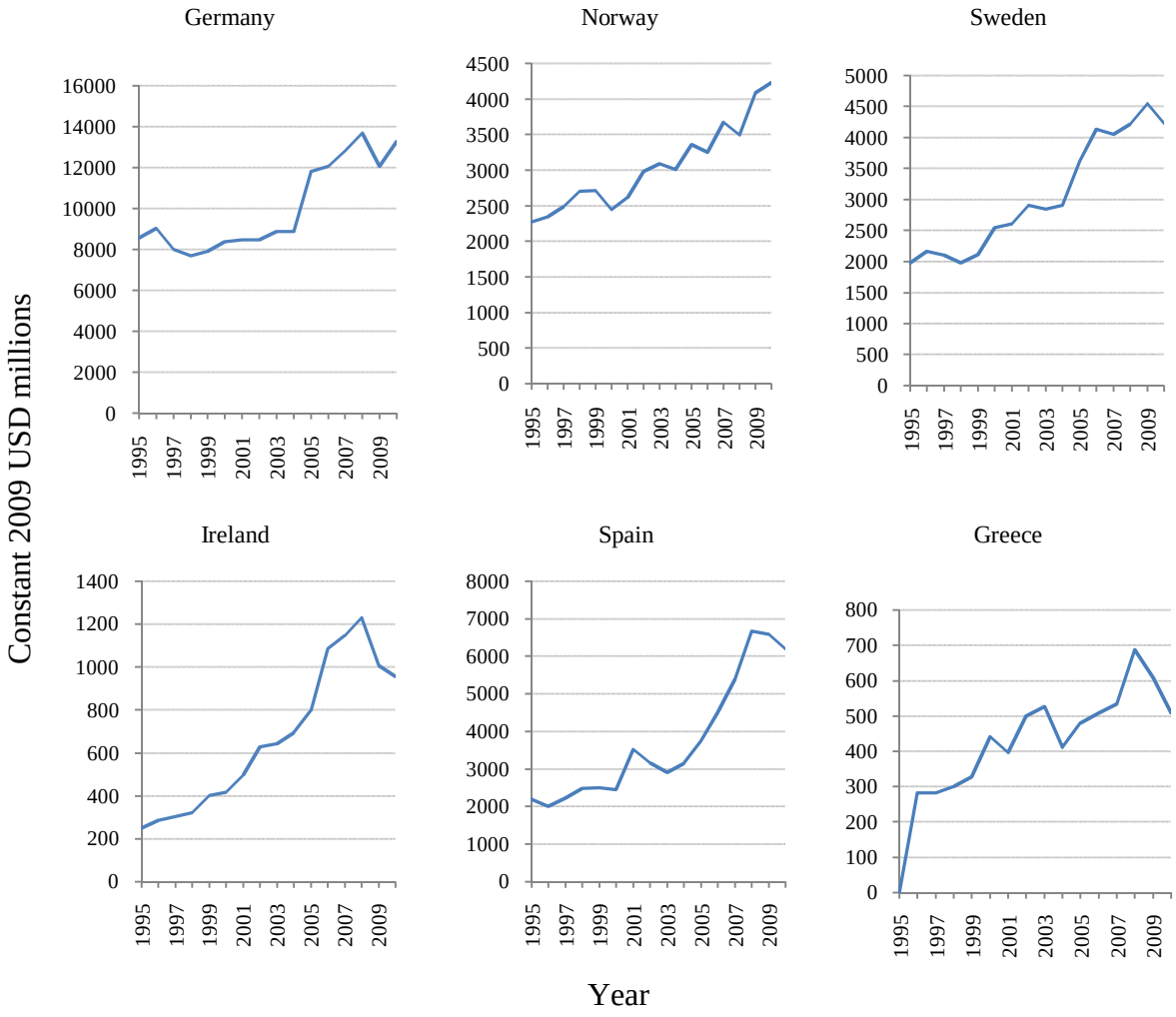
[2] We control for this problem by dropping the US aid observations for years 2004-06.

[3] See also Hudson and Mosley (2008) for further evidence of recent increase in volatility in ODA.

Source: Author's illustration based on data from OECD and OECD-DAC databases.

Aid volatility literature focuses mostly on aid inflows into recipient countries, which may fluctuate for a number of reasons including aid selectivity or conditionality. The issue of aid outflows variability has received only limited attention in the empirical literature. There are also no clear results on the link between donors' economic cycles and their aid budgets.

Figure 6: Aid for selected DAC donors



Note: Aid in USD millions, constant 2009.
Source: Author's illustration based on data from OECD-DAC database.

A result of the lack of studies on donors was that, following the latest crisis, the nascent discussion in this branch of the literature was still investigating whether and to what extent the crisis would affect aid, and was looking at reasons why *aid might not decline at all*. Confusingly there is historical evidence of both phenomena: aid sharply decreasing, and remaining unchanged. For instance, the early 1990s crisis in Nordic countries resulted in a large decrease in

aid flows. But it did not happen during the stagflation period in the 1970s and the dot com bubble of the 2000s (Mendoza et al. 2009). Roodman (2008) and Frot (2009) explore historical evidence of aid reduction after the donor has suffered a crisis. They mention the US in 1988, Japan in 1990, Finland, Norway and Sweden in 1991 and South Korea in 1997. Figure 6 illustrates the evolution of aid supply from some of the main DAC donor countries from 1995 to 2010. Top donors include Germany, Norway and Sweden,[4] while at the bottom we find countries worst hit by the 2007 crisis. The pattern shows an immediate fall in aid in 2008-09 from Germany, Ireland, Spain and Greece while the volatility of aid from Nordic countries, Norway and Sweden, increases. Although this may seem solid evidence, some other countries take milder actions during the crisis. But as all countries are not affected equally by the crisis, so aid budgets do not contribute in the same way to all countries' expenditure. Donors tend to be generally more persistent in increasing rather than in reducing aid, and a coordinated decrease of aid among many donors indicates that it is triggered by a common incident of a global scale, i.e. a crisis. The latest data from the UN EFA (2010) report confirms these trends. After Italy announced cuts of 56 per cent in its aid budget in 2009, Greece and Ireland followed suit with Greece deferred its EU 2010 aid commitment to 2012, cut aid by 12 per cent, resulting in a decrease of the aid to GNI ratio from 0.21 per cent to 0.19 per cent, and Ireland planned to decrease aid by 24 per cent, dropping the same ratio by 5 points from 0.59 per cent. This decrease of the aid-to-GNI ratio indicates that ODA was cut in greater proportion than the economic contraction. In the same trend, Spain announced cuts in its ODA budgets for 2010 and 2011; Norway planned to decrease its ODA by 4.4 per cent, and Sweden, by 7.8 per cent.

The type and severity of financial crisis may be one of the factors explaining differences in behaviour of aid budgets allocation. It is already clear that the recent prolonged global crisis did not just lead to the negative growth rates of donors' GDP but also, to a relatively greater extent, to the fall of ODA (see Table 1). In 2009, 13 out of 23 donors decreased their aid contribution compared to the previous year. On average the decrease occurred one year after the beginning of the recession. This shows the somewhat quick response of governments and the flexibility of aid, even on a rather short time span of one to two years, and that aid budgets are subject to revisions and adjustments. It justifies using a panel VAR approach which focuses solely on the short-run effects.

[4] We exclude the USA which, whilst the largest donor in terms of US$, maintains this position due to its large aid relief programs that do not reflect crisis-related adjustments.

Table 1: Percentage changes in ODA and GDP for selected DAC donors

Selected donor countries	Year	% change in ODA	% change in GDP
Australia	1990	-3.5	-.02
	2009	-7	2.2
Austria	2009	-48	-4
Canada	2009	-22	-3
Denmark	1981	-8	-.08
	2009	.06	-5.4
Finland	1992	-43	-4
	1993	-78	-.08
Germany	2009	-15	-5
Greece	2009	-14	-2
	2010	-18.4	-4.6
Iceland	2009	-29.3	-7.4
	2010	-13.2	-3.5
Ireland	2009	-37.5	-8.2
	2010	-15.3	-1
Italy	1993	-30.3	-.08
	2009	-44	-5.5
	2010	-5.3	1.2
Netherlands	2009	-9	-4
Norway	1993	-22.7	2.7
	2009	-4	-1.7
Portugal	1993	-16	-2
	2009	-20.3	-2.5
Spain	1993	-11.4	-1
	2009	-3.7	-3.8
	2010	-10.2	-.1
Sweden	1993	-35	-2
	2009	-2	-5
Switzerland	1993	-40	1
USA	2007	-5	1

Source: Author's calculations based on data from OECD-DAC database.

1.3 Channels of impact of the crisis on ODA provision

Our objectives are to identify channels of influence of financial and economic crises on aid supply, and to compare the response of ODA to different types of unexpected shocks. We base the variables selection on the literature on instrumental variables of aid in growth regressions (Hansen and Tarp 2001; Dalgaard et al. 2004; Rajan and Subramanian 2008; Arndt et. al 2010; Arndt et. al 2011), aid supply (Alesina et al. 2000; Chong and Gradstein 2008; Jones 2011), VAR models of aid (Frot 2009; Juselius et al. 2011), panel regressions of aid supply (Dang et al. 2009), and banking crisis (Laeven and Valencia 2010; Caprio et al. 2005). Table 2 summarizes and classifies the variables into three categories: domestic social needs, financial conditions and political preferences of the donor country. The variables employed in our analysis have each been found significant in one or more previous studies in the literature. They include GDP, GDP per capita or GDP growth rate (see for instance Chong and Gradstein 2008) as the most important economic factor influencing aid, as well as fiscal balance or government debt (Faini 2006; Boschini and Olofsgard 2007), Misery Index (Mendoza et al. 2009) or more directly,

inflation (Dang et al. 2009; Mendoza et al. 2009) and unemployment (Frot 2009) rates, government expenditures, real exchange rates (Dang et al. 2009), a banking crisis dummy (Dang et al. 2009; Jones 2011), and the political orientation of the governing party (Round and Odedokun 2004; Chong and Gradstein 2008; Tingley 2010).

Table 2: Variables description

Dependent variable: $\frac{Aid}{GDP}$		
Channels		
Domestic social needs d	Financial conditions f of the donor country	Political and socio-economic preferences p
· unemployment rate · inflation rate · Misery Index · fiscal balance as a share of GDP · public debt as a fraction of GDP · government expenditures	· wealth of the country: $\frac{GDP}{POP}$ · GDP growth rate · financial volatility of the stock market (S&P Global Equity Indices) · real exchange rate · banking crisis dummy · trade volumes	· ruling party dummy (left/centre/right)

Note: All variables are in first differences.
Source: Author's illustration; see text.

A simple panel VAR model is specified with GDP, fiscal balance and aid as variables, while our extended panel VAR models include up to 6 variables from Table 2.

The financial conditions of the country are captured by several variables. GDP is a good proxy for the general amount of resources available in the country. It is natural to assume that a donor country will tie their actual yearly aid disbursements to their own available wealth. Richer societies are expected to provide more aid. Yet, GDP is correlated to economic crises; given a certain GDP, governments are constrained by other needs of the country than aid provision. *GDP growth rate* is used for robustness checks, while increasing *government expenditures* contribute to the budget deficit and decrease the resources available for aid. The *fiscal balance* is a short-term flow variable, while the *public debt* represents a longer term stock variable. The rationale behind those two variables is twofold. First, indebted governments are likely to decrease aid spending and prioritize other expenses. Second, these variables also serve as a buffer from aid to GDP in the VAR model specification, explaining the effect of donating aid on the donor's GDP. The *Misery Index*, *unemployment rate* and *inflation* proxy domestic social needs.[5] Raising unemployment and high inflation indicate strong internal priorities for the government, and may require more funds to be reallocated at the detriment of the availability of resources for aid.

[5] Any measure of poverty would be a more natural variable to reflect social needs. However, as we only consider high income countries, and are concerned about crises, unemployment and inflation seem more appropriate.

Greater economic difficulties will then lead to lower support for foreign aid. *Financial volatility* is measured by the S&P global equity indices proxy for the financial market conditions, which especially reflects the volatility of stock markets. Higher stock market volatility indicates higher financial volatility in general, as well as higher uncertainty. Mendoza et al. (2009) find that financial volatility in the US (measured using the S&P500 index) adversely affects ODA, especially for the late 2000s financial crisis.

The *banking crisis dummy* is introduced to capture the difference in magnitude between different types of crises. As not all recessions are equal it is possible that their nature and causes may particularly affect aid. The banking crisis dummy allows us to differentiate between different magnitudes of crises and capture their effects on aid.

Changes in trade volumes are taken into account as the financial crisis had serious implications on international trade, severely decreasing exports. Younas (2008) found that OECD-DAC countries prefer to allocate aid to the recipients who are likely to import their goods. The *real exchange rate* adds to the effect of trade on aid; it is a measure of the loss of domestic power in the donor country. We expect it to have a small effect on aid.

We only have one dummy variable to control for political pressure. Political factors related to the ruling party orientation, which may influence aid budgets, are captured by the *party dummy*. Left wing and right wing parties are expected to have different priorities regarding aid decisions, with the left being egalitarian and the more conservative centre to right parties maintaining social hierarchies and spending less on aid.

1.4 Banking crises and aid

Motivated by the contrasting effects of different financial crises on aid we check the response of aid to macroeconomic variables under crises of various magnitudes, which in turn impact aid differently, and result in ambiguities and in the unpredictability of aid. To account for these magnitudes, we include a banking crisis dummy. We divide the sample into three groups: the full sample group, the expansion group, and the banking crisis or recession group.[6] By applying shocks to different sub-samples we take advantage of the contrasting magnitudes of their standard deviations. Therefore, shocks applied to the expansion data sample model *mild recession*; they model *recession* when applied to the full sample model, and they model *severe crisis* when applied to banking crises data.[7]

We define banking crisis after Laeven and Valencia (2010) who put forward that systemic banking crisis occurs when two conditions are met in addition to falling GDP growth rates: there is financial distress in the banking system in the form of significant bank runs, losses in the banking system, or bank liquidations; and it is followed with banking policy intervention.

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[6] We use data for several crises over different time spans and different countries, so we avoid cross-correlation in the error-term due to crises.

[7] To model different crises we take advantage of the specification of shocks in panel VAR analysis. A shock is equal to one standard deviation and is different for different samples of data: for instance a shock applied to banking crisis observations has a larger magnitude than a shock to the full sample.

Dang et al. (2009) find a large impact of banking crisis on aid and give some possible explanations of this effect. The banking crisis may affect aid both indirectly and directly. The indirect effect happens through ordinary recession and is supported by historical evidence of donors reducing aid flows following crises due to lower revenues (Roodman 2008). The direct effect of banking crisis on aid happens by adding additional fiscal costs and further lowering the GDP e.g. through bailouts (Lancaster 2007). Reinhart and Rogoff (2008) find that banking crises have especially deep and prolonged effects on growth and fiscal balance and cause major disturbances to government revenues. Banking crises have an amplifying effect on aid contraction. With these additional costs added to the costs of recession, donors may find it even more difficult to continue giving aid during and after those crises, than they would in a normal downturn of the same magnitude (Dang et.al 2009).

It is important to mention that there are also counter arguments rejecting any possible role of banking crisis as a determinant of aid, with the central argument that aid simply does not depend on economic factors. Such critical argument can be found in Paxton and Knack (2008). To address these concerns, we check the influence of political factors on aid decisions, and we indeed find them driving aid decisions. However, we find that economic indicators also significantly impact aid budgets.

2 Data

Most data used in this project come from the standard source of the OECD - International Development Statistics (OECD-DAC) database, which contains aid activity. We follow the literature and use net aid disbursements rather than commitments. There is a large gap between the usually higher commitments and lower disbursements, and disbursements are what matter for the budgetary decisions of donor countries, as commitments are but 'promises', more prone to the influence of factors other than economic. All variables are in real US dollars. We use the *net aid disbursements* of 23 DAC donor countries[8] between 1960 and 2010. Data on *GDP, population, fiscal balance, inflation, unemployment, S&P index, foreign exchange rate, trade, GDP growth rate, government expenditures* come from the OECD National Accounts database, the World Band World Development Indicators database and the IMF World Economic Outlook. We calculate the *Misery Index* by adding inflation rate and unemployment rate. *Aid disbursements net of debt relief* used for robustness checks come from the Net Aid Transfers (NAT) data (Roodman 2009). Our primary source of *banking crisis* data is the paper by Laeven and Valencia (2010) and our secondary source is the less recent publication by Caprio et al. (2005). Finally, we use the *party dummy* from the Database of Political Institutions (2010) to account for party orientation.

[8] Donor countries include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the USA. We omit some more recent donors, including Czech Republic, Hungary, Poland, Slovak Republic, Thailand and South Korea.

The *fiscal balance* data limits the span of our data to 30 year, from 1980 to 2010[9] for all models except those with a S&P index, for which we only have observations since the last 20 years, from 1990 to 2010. The *unemployment rate* is defined as the ratio of the number of persons unemployed to the total size of the labour force. The data are primarily taken from the OECD Labor Force Statistics database, but some missing observations are added from the World Bank WDI (e.g. France). Data on *inflation* comes primarily from the World Bank World Development Indicators Database, but missing data before 1989 for the UK and before 1992 for Germany are supplemented by OECD observations. Similarly, data for year 1961 for almost all countries, except Denmark, Ireland and the Netherlands, for which data are not available, are taken from the OECD database.

2.1 Adjustment of ODA for debt relief

We stress the particular importance of carefully selecting the aid variable. It is disputable whether aid should be net of debt relief or if debt relief should be counted as aid. Debt relief initiatives from the 1980s till now have steadily become more generous. The most important include the Heavily Indebted Poor Countries (HIPC) initiative launched in 1996 by the IMF and World Bank and the Multilateral Debt Relief Initiative (MDRI) supplementing the HIPC since 2005 in order to achieve the Millennium Development Goals. Recently, donors granted very generous debt cancellations to Afghanistan, Iraq and Nigeria which inflated the aid figures for 2005-06. In 2007, the Inter-American Development Bank also decided to provide additional debt relief to the 5 HIPCs in the Western Hemisphere, beyond the existing HIPC. Figure 7 shows the difference between ODA and ODA net of debt relief.

Debt relief is one way of delivering aid (Berlage et al. 2003). It is a tool for poverty reduction and impacts development through two main channels: by enhancing incentives for private investment and relaxing constraints for the government, as well as by releasing resources otherwise spent on debt-servicing (Addison 2006). It is considered by some as a more effective mode of aid delivery (IMF and World Bank 2011) but following complex dynamics (Cassimon and Van Campenhout 2007), while others argue that the economic benefits of debt relief are minimal (Bird and Milne 2003; Chauvin and Kraay 2005). A large theoretical literature discussing arguments both in favour and against debt relief has evolved since.[10]

Debt is a complex issue. Its cancellation is granted to developing countries which fulfil certain conditions, upon coordinated agreement of donors. It is also a cost for donors and they may be less willing to cancel debt when their economic conditions are worsening. It constitutes a cost both as forfeited debt repayment and as debt relief related administrative costs. Cordella et al. (2003) address the issue of indebted donors who keep providing aid without granting debt relief, while Birdsall and Williamson (2002) discuss the costs of debt relief for donors.

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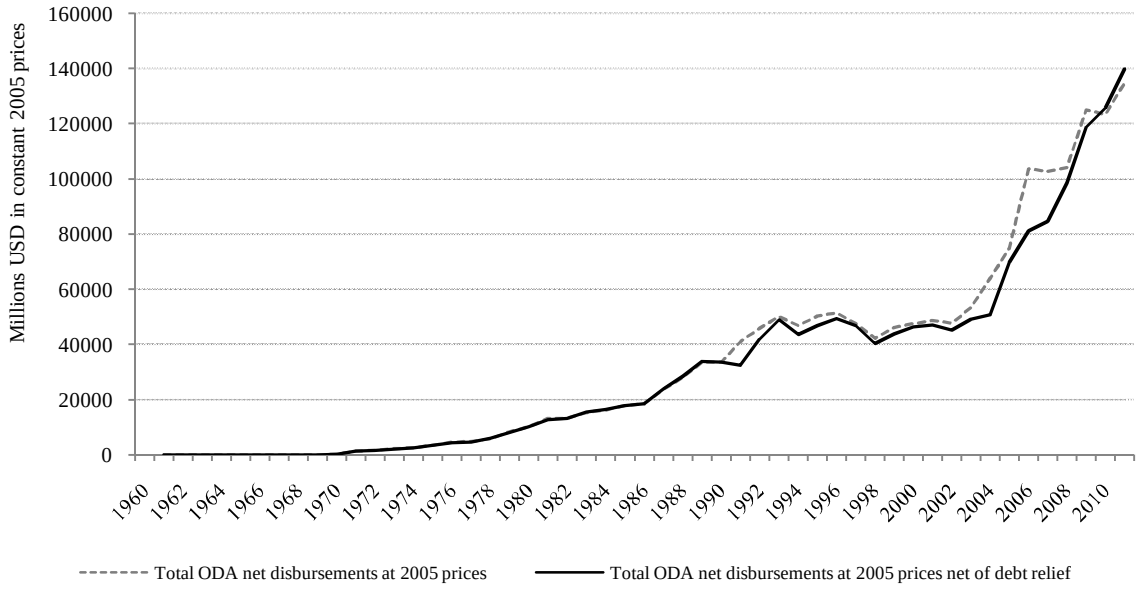
[9] It may be argued that the PVAR technique using GMM estimator is more suitable for short panel data rather than long panel due to serial correlation in the long run. However, we work on sub-samples and avoid this issue. We perform robustness checks for the full sample using shorter panel which yield similar results.

[10] See Cassimon and Vaessen (2007).

Figure 7: Total ODA net disbursements versus total ODA net disbursements net of debt relief



Note: Figures relate to all DAC donors.
Source: Author's illustration based on data from OECD-Development database, 2011.

One criticism is that large variations in aid that are caused solely by debt relief may be weakly related to the preceding economic conditions. In his VAR analysis, Frot (2009) uses this argument and subtracts debt relief from ODA. However, he gets very similar results when using unadjusted ODA. This is our case as well. Our results are very similar when ODA as share of GDP is adjusted for debt relief as when it is unadjusted for it. We decide to use net ODA including debt relief. The primary reason for this is our assumption that debt relief is part of aid flows and serves similar development goals as monetary transfers. It is a cost for donors and therefore it is likely to be affected by adverse economic conditions in donor countries. Finally, there is a more technical reason. The debt relief adjustment is not comprehensive, as many observations are missing. For some countries like Greece, Iceland or Ireland no data on debt relief are available. By only adjusting some years and not others, or some countries and not the others, we are partially removing aid variability due to debt relief, but we are introducing a new variability due to incomplete information.

For robustness checks, we use two alternatives to the net aid disbursements ODA measures, adjusted for debt relief. The first one is the NAT measure (Net Aid Transfers) by Roodman (2009), and the second one is the net ODA disbursements net of debt relief calculated by subtracting the OECD debt relief data from net aid disbursements. Results can be found in Table 9.

3 A theoretical framework

There are $i = 1, \dots, I$ donor countries contributing part of their budgets towards different types of foreign aid $j = 1, \dots, J$. Governments' motives for aid supply are not purely altruistic: they expect to receive some returns in the form of political interests or influences, economic benefits (e.g. through trade), or gratitude. Therefore, they consume aid indirectly. For simplicity, this framework portrays aid as a private rather than a public good. Implementing aid as a public good would allow us to assume that larger donors give on average less aid per capita than smaller donors as public goods in larger donor countries are shared among a larger population. However, our motive is to explore the choice of donors when facing economic crisis; whether to continue financing foreign aid or rather to re-prioritize internal needs.

Consumers in the donor country choose to consume either indirect aid good or the other good. Therefore, let the donor country's individuals have the following utility function (Duddley and Montmarquette 1976):

$$U_{i,t} = f\left(A_{ij,t};\, C_{i,t}\right) \tag{1}$$

where $A_{ij,t}$ is the aggregate amount of donated foreign aid j by country i at time t, and $C_{i,t}$ represents the total consumption in country i at time t of the other good.

Individuals' preferences can be expressed similarly to Chong and Gradstein (2008):

$$U = U_A\left(A_{ij,t}\right) + U_C\left(C_{i,t}\right) = \frac{1}{1-\sigma}\alpha {A_{ij,t}}^{1-\sigma} + \frac{1}{1-\sigma}{C_{i,t}}^{1-\sigma}, \qquad \alpha > 0 \tag{2}$$

where the parameter α captures preferences for foreign aid, and σ is the elasticity of substitution between the two goods. Tarp et al. (1999: 149-69) put emphasis on a two-step aid allocation model. In the first step a donor country decides to which of all potential recipients it will allocate some amount of aid, and the actual amount is determined in a second step. Vázquez (2008) proposes a three-step model, in which the first step is the decision of the donor country's government on the size of its ODA budget. We are only concerned about this first step, the total amount of aid allocated in the budget of the donor.

Income is allocated between consumption, internal government expenditures and foreign aid. So, assuming price a *numeraire*, the donor country budget constraint is:

$$Y_{i,t} = C_{i,t}{A_{ij,t}}^{\alpha}{D_{i,t}}^{\beta}, \qquad \beta > 0 \tag{3}$$

where β represents the preferences for internal expenditures and D stands for the domestic expenditures related to the crisis. We assume $\beta > \alpha$ as consumers will prefer to consume directly good C rather than to indirectly consume good A.

Revenues $R_{i,t}$ come from the income tax $T_{i,t}$ and foreign borrowing $B_{i,t}$, and are used entirely to finance both foreign aid donations $A_{ij,t}$ and internal economic needs $D_{i,t}$. Therefore, they constitute together the government spending $G_{i,t}$:

$$R_{i,t} = B_{i,t} + T_{i,t} \tag{4}$$

$$R_{i,t} = \alpha A_{ij,t} + \beta D_{i,t} = G_{i,t} \tag{5}$$

$$\alpha A_{ij,t} + \beta D_{i,t} = G_{i,t} \tag{6}$$

Similarly to Jones (2011), donors follow their target level of aid, which is subject to external shocks and deviations. Adjustments to shocks may take more than one period.

The supply of foreign aid expenditures by a government i is influenced by the donors' available resources $Y_{i,t}$, by the expenditures $D_{i,t}$ related to the unstable economic conditions, prone to crises, by the target aid level $A_{ij,t-s}$, and by other economic long-run impacts expressed as lagged variables $D_{i,t-s}$:

$$A_{ij,t} = A_{ij,t-s} \sum_{\substack{i=1 \\ t=1}}^{I,T} D_{i,t} \sum_{\substack{i=1 \\ t=1}}^{I,T} D_{i,t-s}(Y_{i,t})(\varepsilon_{i,t}) \tag{7}$$

where the parameter $\varepsilon_{i,t}$ represents other country or time-specific shocks, and s indicates the number of lagged periods. The impact of crisis $D_{i,t}$ is a function of domestic needs d, financial conditions of the donor country f, political preferences and social conditions p:

$$D_{i,t} = f(d_{i,t}; f_{i,t}; p_{i,t}) \tag{8}$$

We expect the aid supply to be an increasing function of i's better financial conditions, political and social preferences (more egalitarian) and available resources, but a decreasing function of the domestic donor's needs:

$$\frac{\partial D}{\partial d} < 0, \qquad \frac{\partial D}{\partial f} > 0, \qquad \frac{\partial D}{\partial p} > 0, \qquad \frac{\partial D}{\partial Y} > 0 \tag{9}$$

4 Empirical strategy

Our empirical strategy is suited for the analysis of the consequences of unexpected macroeconomic shocks. We employ a panel vector autoregression (PVAR),[11] which extends the traditional vector autoregression (VAR) introduced by Sims (1980) with a panel-data approach. The analysis based on VAR offers several advantages. It is a flexible method that treats all the

[11] We use modified versions of the STATA `pvar` and `helm` programs by Inessa Love, first used by Love and Zicchino (2006). The original programs are available at http://go.worldbank.org/E96NEWM7L0.

variables in the system as endogenous and independent, without worrying about causality direction. Each variable is explained by its own lags, and by lagged values of the other variables. It is a system of equations rather than a one-equation model. Panel VAR allows for unobserved individual heterogeneity and improves asymptotic results. Panel VAR simplifies some common aid related issues, e.g. the choice of suitable instrumental variables. The results of a panel VAR analysis are insightful and go beyond to coefficients, revealing the adjustments and resilience of aid to unexpected shocks, as well as the importance of different shocks.

The general form of a PVAR analysis is exemplified by Canova and Ciccarelli (2004):

$$y_{i,t} = A_0 a_{i,t} + L_1 y_{i,t-1} + \cdots + L_p y_{i,t-p} + u_t \quad (10)$$

where $y_{i,t}$ is a $K \times 1$ vector of K panel data variables, $i = 1, \ldots, I$, $a_{i,t}$ is a vector of deterministic terms such as linear trend, dummy variables or a constant, A_0 is the associated parameter matrix, and the $L's$ are $K \times K$ parameter matrices attached to the lagged variables $y_{i,t}$. The lag order (VAR order) is denoted by p. The error process u_t consists of three components:

$$u_t = \mu_i + \gamma_t + \varepsilon_{i,t} \quad (11)$$

with μ_i representing the country specific effect, γ_t capturing the yearly effect, and $\varepsilon_{i,t}$, the disturbance term. The error term u_t is assumed to have zero mean, $E(u_t) = 0$, and the time invariant covariance matrix and u_ts are independent.

This specification imposes two restrictions: it assumes common slope coefficients, and it does not allow for interdependencies across units. Given these restrictions, the estimated matrices *L* are interpreted as average dynamics in response to shocks. As with standard VAR models, all variables depend on the past of all variables in the system, the main difference being the presence of the individual country-specific terms μ_i.

Previous studies (Dang et al. 2009, Mendoza 2009) established that financial crises have an intrinsic effect on aid supply. These studies applied panel data analysis to past crises. There are also some studies using the PVAR technique in the aid literature: Osei et al. (2005) focused on the fiscal effects of aid in developing countries, while Morrissey et al. (2006) and Gillanders (2011) examined the impact of aid on growth. This technique appears rarely in aid-related research. Juselius et al. (2011) used VAR to analyse impact of foreign aid in African countries, Frot (2009) used VAR in the context of aid and financial crisis, while Hansen and Headey (2010) used PVAR to analyse the impact of aid on net imports and spending.

We are using the PVAR approach to estimate the effects on aid supply of unexpected macroeconomic shocks to variables that are particularly responsive to economic downturns. VAR modelling does not require the imposition of strong structural relationships, although theory is involved to select the appropriate normalization and to interpret the results. Another advantage is that only a minimal set of assumptions is necessary to interpret the impact of shocks on each variable of the PVAR system.

The reduced form VAR, once the unknown parameters are estimated, permits implementing dynamic simulations. This method only allows for the analysis of *short-run adjustment effects* and not of structural long-run effects. The results come in the form of *impulse response functions (IRFs)* and their *coefficients* analysis, as well as *forecast error variance decompositions (FEVDs)* that let one examine the impact of *innovations*[12] or shocks to any particular variable on other variables in the system. IRFs model the dynamics of the response; the coefficients represent the average effects of IRFs and permit recognizing the significance of the overall response, while variance decompositions give information about the variation in one variable due to shock to the others. The response corresponds to a one-time shock in other variables, holding all the other shocks constant at zero. In other words, *orthogonalizing* the response allows us to identify the effect of one shock at a time, while holding other shocks constant. We are particularly interested in the impact of shocks to macroeconomic variables and the response of the aid variable.

To obtain orthogonalized impulse response functions, we decompose the residuals in a way that makes them orthogonal. Such exercises require applying a careful VAR identification procedure. The most common way to deal with this problem is to choose a *causal ordering*. We adopt the Choleski decomposition[13] of variance-covariance matrix of residuals. This process is called VAR identification and involves a particular ordering of variables in the VAR system. We allocate any correlation between the residuals to the variable that appears earlier in the ordering. The identifying assumption is that the variables that appear earlier in the system are more exogenous, and those which appear later are more endogenous. That implies that the variables that appear earlier affect the following variables contemporaneously and with lags, while the variables that appear later only affect the previous variables with lag.

The simple model has 3 variables: GDP per capita, fiscal balance and aid as a share of GDP, in this particular order required for the identification of the VAR system. Hence, $GDP\ per\ capita_{it}$ is the most exogenous variable, and $(\frac{Aid}{GDP})_{it}$, the most endogenous.

$$GDP\ per\ capita_{it} \rightarrow Fiscal\ balance_{it} \rightarrow (\frac{Aid}{GDP})_{it} \qquad (12)$$

As it is a set of endogenous equations, all variables influence each other. Aid is contemporaneously affected by GDP and fiscal balance as lower GDP will result in lower aid, and higher deficit lowers aid as well. There is no reasonable justification of why ODA would affect GDP in donor countries, but inserting fiscal balance in between makes it a buffer from aid to GDP. Aid only affects GDP and fiscal balance with some lag as public spending contributes positively to the budget deficit, which in turn lowers GDP. This impact is probably of negligible importance, but allows for the correct specification of the VAR system. The theoretical explanation of our model requires a delay in the indirect observation and consumption of aid by donor countries, thus GDP only responds to aid with lag.

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[12] There is a substantial body of literature showing that responses to positive and negative shocks are *asymmetric* (Cover 1992; Edwards and Levy Yeyati 2005). However, these studies mostly address the responses of the main macroeconomic variables, like output, of which aid is not part. We therefore assume for simplicity that positive and negative shocks are symmetric.

[13] See Hamilton (1994) for discussion about impulse response functions and derivations.

The simplest 3-variable PVAR model is specified and can be represented as:

$$\begin{bmatrix} 1 & a_{12} & a_{13} \\ a_{21} & 1 & a_{23} \\ a_{31} & a_{32} & 1 \end{bmatrix} \begin{bmatrix} \left(\Delta \frac{gdp}{pop}\right)_{i,t} \\ (\Delta fb)_{i,t} \\ \left(\Delta \frac{aid}{gdp}\right)_{i,t} \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \\ a_{30} \end{bmatrix} + \begin{bmatrix} L_{11} & L_{12} & L_{13} \\ L_{21} & L_{22} & L_{23} \\ L_{31} & L_{32} & L_{33} \end{bmatrix} \begin{bmatrix} \left(\Delta \frac{gdp}{pop}\right)_{i,t-p} \\ (\Delta fb)_{i,t-p} \\ \left(\Delta \frac{aid}{gdp}\right)_{i,t-p} \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix} \quad (13)$$

where $y_{i,t}$ is a 3-variable vector including 3 endogenous variables: gdp per capita $\Delta \frac{gdp}{pop}$, fiscal balance Δfb, and aid $\Delta \frac{aid}{gdp}$. The $3x3$ matrix L contains the coefficients of contemporaneous relationships between the 3 variables. We are interested in the impulse responses of aid to shocks in GDP and fiscal balance.

4.1 Data preparation

Applying the VAR technique requires some data transformations to remove the trend and only keep the variations. The use of panel data imposes that the underlying structure is the same for each cross-sectional unit, i.e. that the coefficients in the matrices *L* are the same for all countries in our sample. This constraint is violated in practice, so to overcome this restriction and allow for country heterogeneity, fixed effects (μ_i) are introduced. However, fixed effects are correlated with the regressors due to lags of the dependent variables (Arellano and Bond 1991; Blundell and Bond 1998). We employ forward mean-differencing (Arellano and Bover 1995) to eliminate the *fixed effects*. This procedure is also called a *Helmert transformation*, and keeps the orthogonality between variables and their lags, so we can use lags are as instruments.[14] Another issue is that of the cross section autocorrelation related to the *common factors* (Levin and Lin 2002). Indeed, panel data with groups of countries sharing some homogeneity presents some interdependence between countries which may affect the results. To adjust for such common factors, we subtract from each series at any time the average of the group (e.g. Nordic, South). The last transformation, *time-demeaning,* is performed to control for time fixed effects (γ_t). We subtract the mean of each variable calculated for each country-year.

We then run the model in first differences to focus on the dynamics of aid adjustments and short-run effects.[15] In the context of crisis, short-run effects are the most interesting. We need stationary data in order to proceed with panel VAR. Our data is necessarily stationary as it is in first differences; however, for the sake of scrutiny, we still test whether the main variables of interest are stationary by examining three different panel unit root tests: the Levin and Lin (2002) test, the Breitung (2001) test and the Im, Pesaran and Shin (2003) test. All unit root tests are reported in Table 3. The results strongly suggest that the net development aid as share of GDP,

[14] The coefficients are estimated by the GMM, which, in our case, is just identified with the number of regressors equal to the number of instruments. It is equivalent to 2SLS.

[15] Another way to proceed would be to test for stationarity variables in levels and if they are found non-stationary, to test for cointegration relationship between variables. The absence of cointegration relationship would justify solely focusing on short-run and using variables in first differences, while the presence of cointegration would call for structural VAR analysis of long-run effects. This paper does not address long-run effects and therefore we directly use variables in first differences.

the GDP per capita, the fiscal balance as well as other variables do not follow a unit root process. Non-stationarity is not a major concern for the variables included in the analysis; therefore it seems appropriate to proceed with data preparation for the estimation of the panel VAR models.

Table 3: Panel unit root tests

	ODA_{it}	GDP_{it}	FB_{it}	GD_{it}	$Misery_{it}$	$Unempl_{it}$	$Infl_{it}$	SP_{it}	$FOREX_{it}$	$Trade_{it}$	GX_{it}
Levin-Lin-Chu unit-root test											
Adjusted t*	-5.3835	-10.0245	-9.7461	-6.5271	-5.8598	-5.4244	-19.5860	-13.9910	-12.3311	-15.5764	-10.4716
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	H_0: Panels contain unit roots, H_a: Panels are stationary Common AR parameter.										
Breitung unit-root test											
Lambda	-7.2982	-12.3831	-10.9010	-2.6310	-10.5937	-6.1151	-18.3369	-11.7802	-8.4662	-14.5417	-10.1163
p-value	0.0000	0.0000	0.0000	0.0043	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	H_0: Panels contain unit roots, H_a: Panels are stationary Common AR parameter.										
Im-Pesaran-Shin unit-root test											
Z-t-tilde-bar	-6.4688	-11.5218	-9.9877	-1.3619	-11.8022	-5.3954	-20.3643	-10.5399	-11.6682	-15.2542	-11.2238
p-value	0.0000	0.0000	0.0000	0.0866	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	H_0: All panels contain unit roots, H_a: Some panels are stationary Panel-specific AR parameter.										

Notes: Number of panels = 21 (SP), 23 otherwise.
Number of periods = ODA (13), GDP (39), FB (26), GD (11), Misery (22), Unempl (16), Infl (48), 14 (SP), FOREX (29), Trade (37), GX (30).
Source: Author's calculations.

5 Results

We evaluate the effects of shocks to a set of macroeconomic variables on aid in 23 ODA donor countries. Our main findings confirm the strong negative relationship between aid supply and GDP, on mid-term. This result is significant considering the whole sample or only expansions. During recessions, the response of aid to shocks to GDP is stronger and significant but only appears in the second lag of GDP. This suggests that donors do not adjust aid budgets immediately during recessions.

GDP explains more of the ODA variations during the crisis. It accounts for up to 12 per cent 3 years after the negative shock, compared to 3.1 per cent if we are not restricted to the crisis. This result indicates the large influence of the negative GDP shock on aid.

There exists a mid-run relationship between aid and fiscal balance, with a longer time span than in the case of GDP. This relation is negative and significant during recessions. The fiscal balance explains about 3 per cent of variations in aid during the crisis, but only 1.3 per cent otherwise.

The impulse response functions give us information about the short-run dynamics of those impacts. Most shocks start to have a noticeable influence on the economy after 1 to 1.5 years, and are absorbed within 8 years.

Our analysis results for shocks ‘before and after’ the crisis suggest that crises trigger some structural changes: while aid supply is negatively affected by a shock to GDP before the crisis, this effect disappears if the shock occurs after the crisis. Understandably, the economies and aid budgets are more resilient after having adjusted to the crisis.

We also find that right and center wing governments cut on aid supply in reaction to shocks, while left wing governments do not. Moreover, center parties appear driven by economic factors, while left and right-wing parties, by their ideological views.

Lastly, we extend the model to analyze the transmission of shocks to aid supply through other variables, including the Misery Index, S&P stock market index, government debt, trade, real exchange rate, government consumption and GDP growth rate. We find that financial volatility decreases aid and introduces some uncertainty to aid through fluctuations of its budget. Surprisingly, variables related to social needs of the donor country are negligible for aid policies, and do not influence aid budgetary decisions. Economic variables and governments in power are shaping aid.

The next sections expose the detailed results of the simple and extended PVAR models.

5.1 The simple three-variable PVAR model

The simplest model consists of only three variables: GDP per capita, fiscal balance and aid as a share of GDP. After applying the identifying assumptions and transforming the data, we run the panel VAR model. The impulse response functions include their confidence intervals,[16] represented by the lower and upper lines on the graphs on Figure 8 or 9; the middle lines are the actual response functions, depicting the dynamics of the response of aid to shocks to other variables. This layout allows recognizing the time-dependent significance of each response directly from the graph. We also report coefficients which are the average effects of the response (e.g. Table 3), as well as variance decompositions (e.g. Table 4) which explain variations in aid variable due to shocks in other variables.

Recessions and expansions analysis

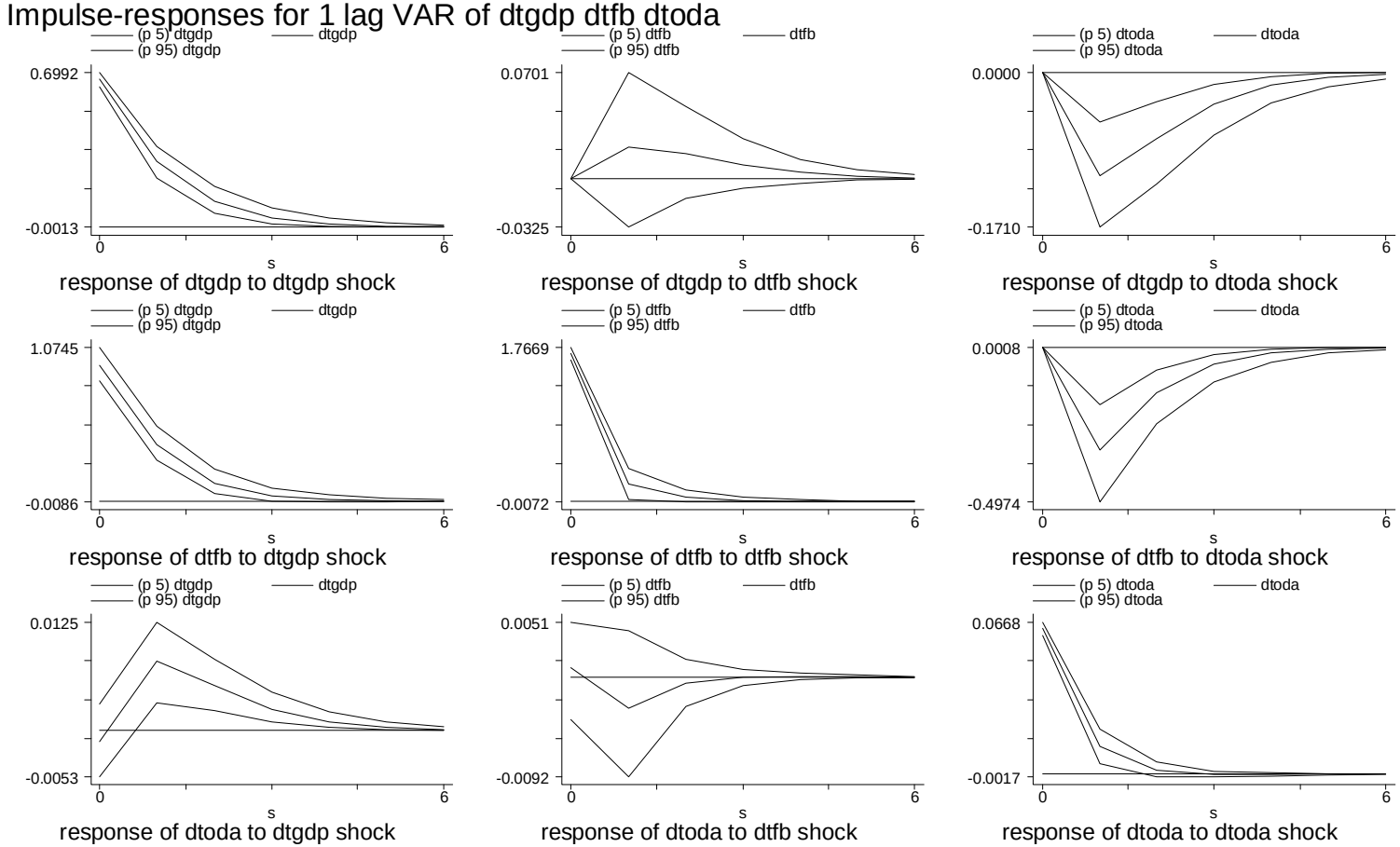
To model the response of aid during mild recessions, severe global crises and ordinary recessions we divide our data into three sub-samples: expansion, recession, which uses strict definition of banking crisis by Laeven and Valencia (2010), and the full sample. One standard deviation shocks applied to those sub-samples differ and allow us to account for different crisis magnitudes. Figures 8 and 9 present the impulse response functions to one positive standard deviation shocks for the full sample of donor countries for 1-lag and 2-lags models, and serve as a sanity check of the proposed model.

A positive shock to GDP increases aid (see bottom left graph on Figure 8). This result is logical as an economy with more resources is expected to provide more development aid. The effect becomes significant only after the first year. The shock is stable and absorbed within six years. The IRF of aid to the shock to GDP in the 2-lag analysis (Figure 9) offers additional insights. The positive effect on aid is only in medium term, and lasts from one to four years after the shock. This seems reasonable as the response of aid budgets is not immediate and is constrained by the cycles of governments in the donor countries.

Improvement in fiscal balance has no significant effect for 1-lag PVAR although it increases aid in the medium run which is evident for 2-lag PVAR (see bottom row, middle graph on Figure 9). The response of ODA to fiscal balance shock becomes unstable in the 2-lag model. Responses of other variables are sound. Improvement in fiscal balance increases GDP which is plausible; it may happen due to increased government revenues. GDP falls in response to shock to ODA which is expected; more aid is an additional cost for the government so a decrease of GDP is natural. We also notice that six periods is insufficient for the economy to absorb shocks, therefore subsequently we increase the adjustment time to eight periods.

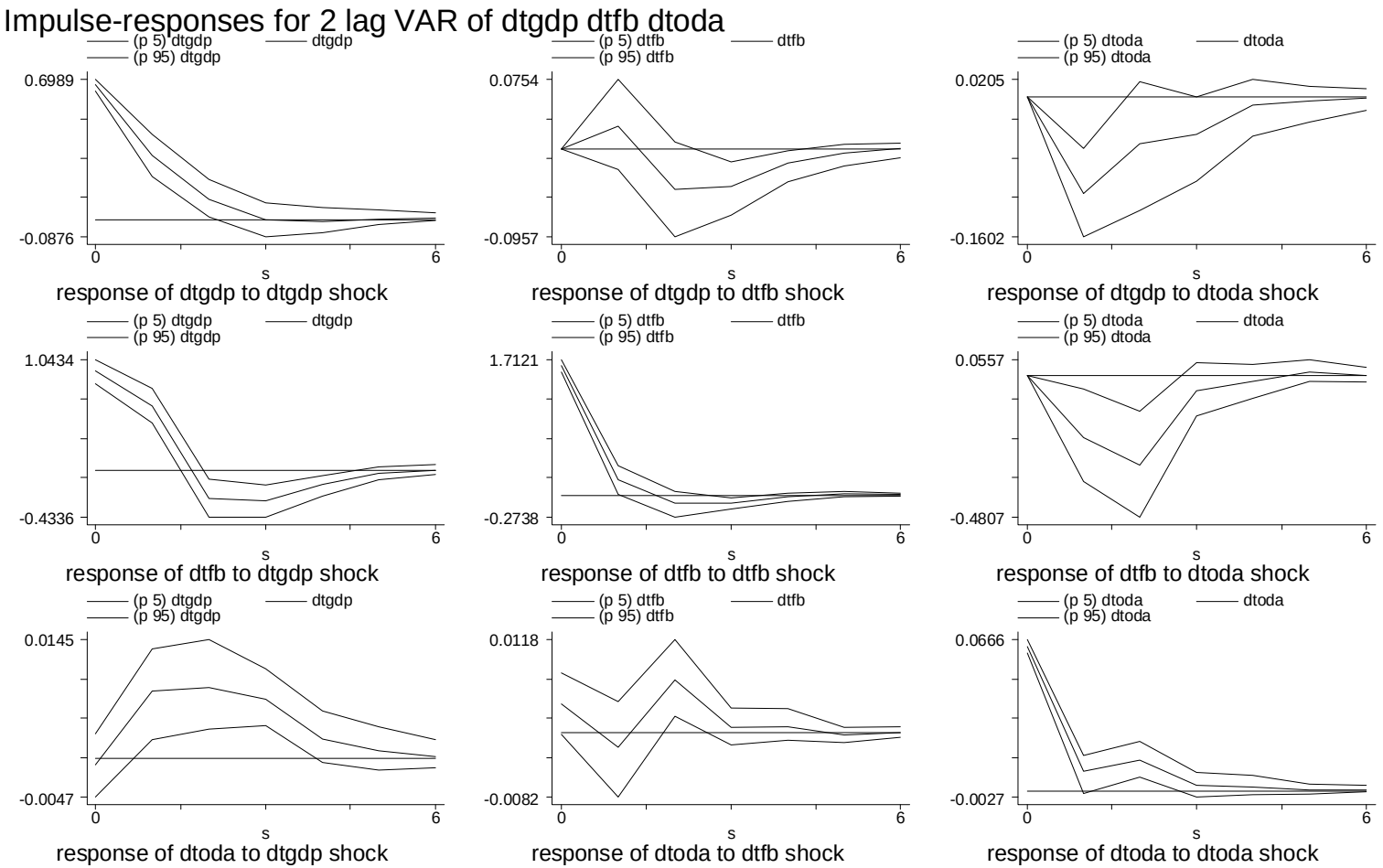
[16] Since the IRFs are computed using the estimated PVAR coefficients, the standard errors of these coefficients need to be taken into account. This is done with Monte Carlo simulation, in which the parameters of the model are re-calculated 1000 times using the estimated coefficients and their variance-covariance matrices as underlying distribution. The 5^{th} and 95^{th} percentiles from the resulting distribution are then used to generate the lower and upper bounds of the impulse response functions.

Figure 8: Estimation (1p): Impulse response functions of the GDP, fiscal balance and ODA to a positive standard deviation shock
in 1-lag PVAR analysis



Source: Author's computations.

Figure 9: Estimation (2p): Impulse response functions of the GDP, fiscal balance and ODA to a positive standard deviation shock in 2-lag PVAR analysis



Source: Author's computations.

Table 4: Main results for the three-variable PVAR model of recessions and expansions

POSITIVE SHOCKS							
Response of	Response to GDP_{t-1}	fb_{t-1}	ODA_{t-1}	GDP_{t-2}	fb_{t-2}	ODA_{t-2}	Obs.
Full sample							
(1p) ODA	.0149*** (.004)	-.002 (.002)	.184*** (.074)	-	-	-	633
(2p) ODA	.014*** (.005)	-.001 (.002)	.132* (.074)	.001 (.006)	.004** (.002)	.220*** (.074)	610
NEGATIVE SHOCKS							
Response of	Response to $NGDP_{t-1}$	Nfb_{t-1}	ODA_{t-1}	$NGDP_{t-2}$	Nfb_{t-2}	ODA_{t-2}	
Full sample (models ordinary recession)							
(1n) ODA	-.0149*** (.004)	.002 (.002)	-	-	-	-	633
(2n) ODA	-.014*** (.005)	.001 (.002)	-	-.001 (.006)	-.004** (.002)	-	610
Recession, banking crisis (models severe crisis)							
(3n) ODA (bd=1)	.011 (.012)	-.011** (.005)	-	-	-	-	102
(4n) ODA (bd=1)	.025 (.018)	-.009 (.007)	-	-.037** (.018)	.000 (.004)	-	72
Expansion (models mild recession)							
(5n) ODA (bd=0)	-.015*** (.005)	.005 (.003)	-	-	-	-	488
(6n) ODA (bd=0)	-.012*** (.006)	.004 (.002)	-	-.003 (.006)	-.002 (.002)	-	455

Notes: *** indicates 1 per cent significance level (t-test>2.35); ** 5 per cent (t-test>1.96); *10 per cent (t-test>1.65); standard errors are in parentheses; bd=1 indicates controlling for banking dummy; three variable VAR model is estimated by GMM; country-time fixed effects and common factors are removed prior to estimation.

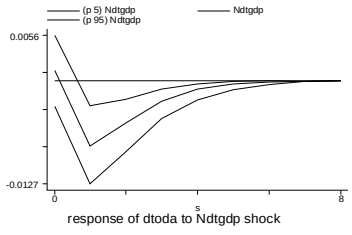
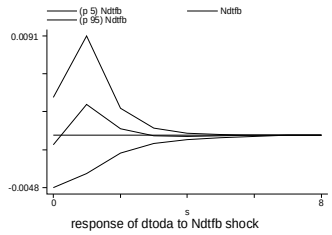
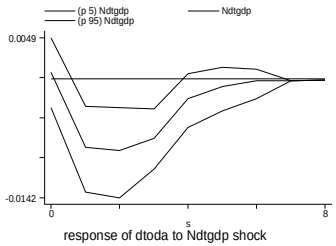
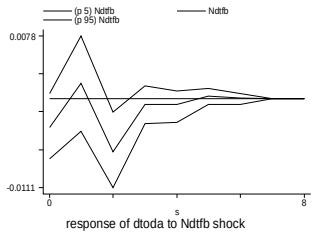
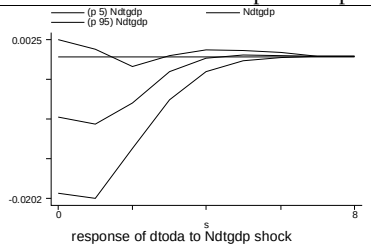
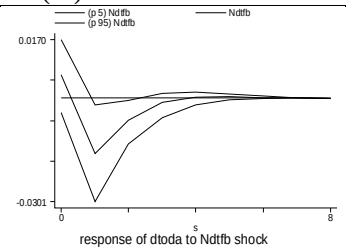
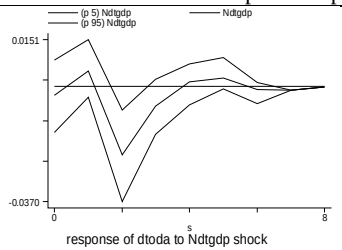
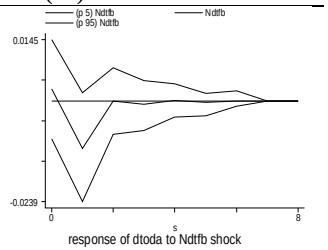
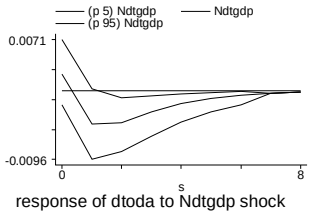
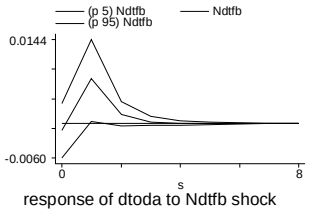
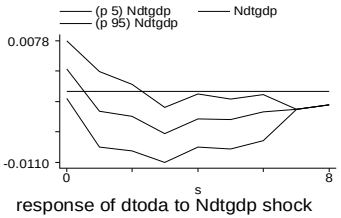
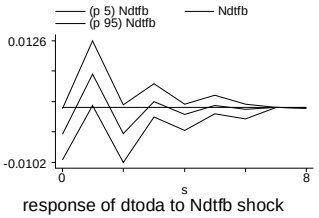
Source: Author's calculations.

Table 4 shows the estimated coefficients of the system of three variables: GDP per capita, fiscal balance and aid as a share of GDP. Our results show that in response to shock, aid budgets are decreased. The results are significant, indicating a lasting influence. The average effects of shocks to GDP decrease aid after the first year for both the full sample (-.014) and the expansion sample (-.012), while this contraction comes after the second year and with more than double the magnitude for the banking crisis sample (-.037). There exists a positive relationship between aid and GDP; when GDP decreases, aid decreases as well. This relationship is not uniform and changes with the crisis itself. This finding is important because it confirms that aid is cut in a response to deteriorating economic conditions. Increasing budget deficit contributes to aid contraction after the first year during banking crises (-.011), and has a

mild effect after two years considering the full sample (-.004). Fiscal balance does not have any significant average effect on aid during expansions.

A few conclusions may be drawn from this analysis. Aid decreases in response to shocks to the main macroeconomic variables, and it happens earlier during expansions compared to banking crisis. Fiscal balance is used in a different way as a policy instrument, allowing increasing budget deficit during expansions but not during crises. We interpret these findings in two complementary ways, using business cycles and expectations, and fiscal stimulus. Business cycles are economy-wide fluctuations in activity, and include periods of rapid economic growth (expansions), and periods of relative stagnation or decline (recessions). During expansion, when GDP falls, there are expectations that the economy is entering a recession that may prolong. The government takes action and decreases aid immediately. In contrast, when a negative shock hits the economy during a recession, the GDP falls as well, but its decrease is consistent with the expectations, so the adjustment of aid is slower. The decrease in aid only occurs after the second year, but its negative effect is stronger. Fiscal stimulus is the proposition that the government can raise the overall state of the economy by borrowing money, raising output, which, as a corollary, makes it more likely to preserve aid levels. A shock to the fiscal balance decreases aid during the recession, as the government is not ready to run a higher budget deficit to keep aid at its increasing trend. This supports the hypothesis discussed earlier of higher fiscal costs of banking crises for the government.

Figure 10: 1 and 2-lag VAR response of ODA to the negative shocks to GDP and fiscal balance for the full sample, crises or expansion

1 lag PVAR model		2 lags PVAR model	
Full sample			
Impulse response functions (1n)		Impulse response functions (2n)	
GDP	Fiscal balance	GDP	Fiscal balance
			
Recession (banking crisis)			
Impulse response functions (3n)		Impulse response functions (4n)	
			
Expansion			
Impulse response functions (5n)		Impulse response functions (6n)	
			

Note: Errors are 5 per cent intervals generated by Monte-Carlo with 1000 repetitions.
Source: Author's computations.

The impulse response functions of the recessions and expansions analyses are presented in Figure 10. The response of aid to GDP shock is robust and negative, as aid decreases, but this effect is significant after the first year regardless of the sample. The IRFs show that the decrease in aid is steeper and the adjustment is quicker during banking crises (estimation 3n on Figure 10) than during expansions (estimation 5n on Figure 10), for which the adjustment takes 8 years. This is consistent with the expectation that adjustments to GDP are faster during banking crises as per the higher GDP volatility and standard deviation. As a result aid adjusts faster. In contrast, expansions are associated with lower GDP volatility, a lower standard deviation, and slower aid adjustments.

The response of aid to a negative shock to the fiscal balance is *positive* during expansions (fiscal stimulus) and *negative* during banking crises (high fiscal costs). Although the positive impulse response function of aid to fiscal balance shock is insignificant, it shows the importance of fiscal policies. The impulse response functions of 2-lag PVAR models (estimations 4n and 6n in Figure 10) show that shocks to GDP have particularly persistent effects on aid during expansions and fiscal balance experiences some fluctuations in response.

Table 5: Forecast Error Variance Decomposition for recessions and expansions analysis

Variance of ODA as share of GDP explained by negative shock in each variable

	t=2	t=3	t=4	t=6	t=10
Full sample					
GDP per capita	.016	.031	.042	.043	.043
Fiscal Balance	.004	.013	.013	.014	.014
ODA as share of GDP	.980	.955	.945	.943	.943
Banking crisis					
GDP per capita	.009	.120	.127	.128	.129
Fiscal Balance	.035	.031	.031	.031	.031
ODA as share of GDP	.956	.849	.842	.841	.840
Expansion					
GDP per capita	.006	.009	.019	.027	.032
Fiscal Balance	.017	.020	.020	.020	.020
ODA as share of GDP	.980	.971	.961	.953	.948

Note: 2-lag panel VAR models for two samples: full sample (estimation 2n), banking crisis sample (estimation 4n) and expansion sample (6n).

Source: Author's calculations.

Table 5 gives the forecast error variance decomposition (FEVD) across variables in the PVAR system. Considering the full sample, we see that GDP can explain up to 4.3 per cent of the forecast error variance in aid after ten periods, but nearly 13 per cent during banking crisis, and only 3.2 per cent during expansion. This result indicates a larger magnitude of the influence of the GDP shock on aid during banking crises. The fiscal balance follows a similar general pattern and explains 3.1 per cent of the forecast error variation in aid during banking crises, but only 2 per cent during expansion and 1.4 per cent for the full sample. Overall these results serve as evidence that GDP plays a role in aid decisions and that economic factors should not be

considered negligible. Clearly there exists a relationship between the economic conditions of the donor country and the amount of aid donated.

Before and after the crisis analysis

We define the crises similarly to Laeven and Valencia (2010). However, we restrict our definition to the crises with a sharp decrease in GDP only. We consider the case of any crisis, including both systemic and non-systemic crises as well as cases of exclusively systemic or non-systemic crises. Our objective is to determine whether crises have any structural effect on aid supply. Do donor countries change their aid strategy or just adjust aid flows in response to the crises?

The years before the crisis and the year of crisis are defined as 'before the crisis', while the years after the crisis are defined as 'after the crisis'. We assume that it takes ten years of average before the economy fully recovers. Therefore, the period 'after the crisis' lasts ten years in most cases.

Table 6: Main results for the 3-variable PVAR model of before and after the crisis analysis

NEGATIVE SHOCKS					
Response of	Response to $NGDP_{t-1}$	Nfb_{t-1}	$NGDP_{t-2}$	Nfb_{t-2}	Obs.
Before the crisis					
(7n) ODA, bd=0	-.016*** (.005)	.004 (.003)	-	-	453
(8n) ODA, bd=0	-.013* (.007)	.004 (.003)	-.003 (.007)	-.003* (.002)	421
After the crisis					
(9n) ODA, bd=1	.000 (.009)	-.006 (.004)	-	-	140
(10n) ODA, bd=1	.007 (.013)	-.003 (.005)	-.027*** (.011)	.001 (.003)	110

Notes: *** indicates 1 per cent significance level (t-test>2.35); ** 5 per cent (t-test>1.96); * 10 per cent (t-test>1.65); standard errors are in parentheses; bd=1 indicates controlling for banking dummy; three variable VAR model is estimated by GMM; country-time fixed effects and common factors are removed prior to estimation.

Source: Author's calculations.

The analysis yields similar coefficients (Table 6) and impulse response functions (Figure 11) to those found in the previous section (Table 4 and Figure 10). If the shock takes place before the crisis, we observe a negative and significant effect on aid. However, when it hits after the crisis, during the recovery period, the effect, albeit positive and very small, is insignificant. Aid decreases immediately before the crisis in response to falling GDP and additionally responds negatively to fiscal balance shocks but after two periods. After the crisis, aid is more resilient to shocks as policies are likely to be already adjusted for degraded economic conditions. Additionally, there is room for fiscal deficit. However, if the shock persists the contraction is

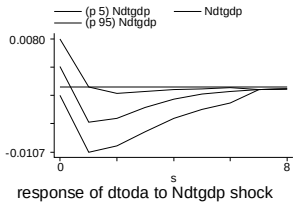
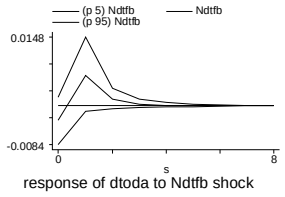
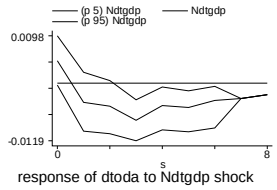
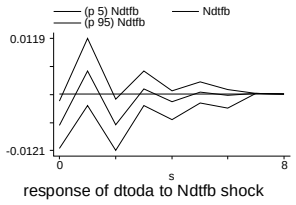
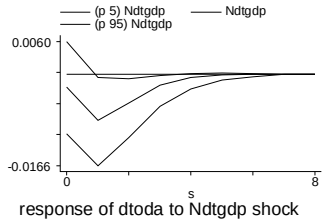
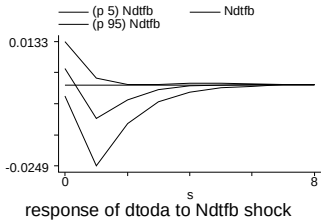
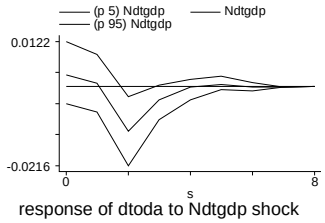
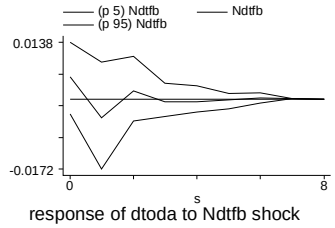
stronger after the crisis. FEVDs show that variations in GDP after ten periods explain 5.3 per cent of changes in aid for shocks after the crisis, and 3.9 per cent before the crisis (Table 7). The magnitude of the effect is rather small.

Table 7: Forecast Error Variance Decomposition for before and after the crisis analysis

Variance of ODA as share of GDP explained by negative shock in each variable					
	t=2	t=3	t=4	t=6	t=10
Before the crisis					
GDP per capita	.010	.013	.025	.033	.039
Fiscal Balance	.016	.023	.023	.023	.023
ODA as share of GDP	.974	.964	.952	.944	.938
After the crisis					
GDP per capita	.003	.049	.053	.053	.053
Fiscal Balance	.016	.017	.017	.017	.017
ODA as share of GDP	.981	.934	.930	.930	.930

Note: Two lag panel VAR models for two samples: before the crisis (estimation 8n), after the crisis (estimation 10n).
Source: Author's calculations.

Figure 11: 1 and 2-lag VAR response of ODA to the negative shocks to GDP and fiscal balance for before and after the crisis

1 lag PVAR model		2 lags PVAR model	
Before the crisis			
Impulse response functions (7n)		Impulse response functions (8n)	
GDP	Fiscal balance	GDP	Fiscal balance
			
After the crisis			
Impulse response functions (9n)		Impulse response functions (10n)	
			

Note: Errors are 5 per cent intervals generated by Monte-Carlo with 1000 repetitions.
Source: Author's computations.

Do political influences matter for aid supply?

The previous sections established the relationship between economic indicators and aid supply. The current section accounts for the possibility that political pressure may regulate aid budgets in times of economic slowdown in donor countries. The literature on aid frequently highlights the role of politics as an explanation of aid allocation (McKinlay and Little 1977; Maizels and Nissanke 1984; Alesina and Dollar 2000; Burnside and Dollar 2000). However, the political variables employed in these studies do not represent the domestic politics of the donors, but rather analyse the role of politics at the international level. The importance of domestic politics in donors on aid policy is emphasized by Fleck and Kilby (2006), Lancaster (2007), Noel and Therien (1995) and Therien and Noel (2000). This corpus of literature suggests that political parties and domestic political institutions play an important part in shaping foreign aid policy. Recently, Tingley (2010) looks at how a donor's domestic political and economic environment influences aid supply, defining *aid effort*. He finds that, as governments become more conservative, their aid effort is likely to fall. Some research also exists that centres on voters in donor countries. For instance, Chong and Gradstein (2008) find evidence suggesting that populations satisfied with the governance of their country give more support for aid.

In times of crisis, political pressure might be even greater, and aid is a budget expense on which saving is easy. We divide our sample into right, left and centre governing parties. We then apply a one standard deviation shock which models recession. The average effects coefficients can be found in Table 8.

Table 8: Main results for the three-variable PVAR model of political influences

NEGATIVE SHOCKS					
Response of	Response to $NGDP_{t-1}$	Nfb_{t-1}	$NGDP_{t-2}$	Nfb_{t-2}	Obs.
Right wing ruling party					
(11n) ODA, party=1	-.013 (.009)	-.001 (.004)	-	-	246
(12n) ODA, party=1	-.030*** (.011)	.005 (.003)	.008 (.013)	-.004* (.002)	209
Centre					
(13n) ODA, party=2	-.013** (.006)	-.008* (.005)	-	-	71
Left					
(14n) ODA, party=3	.003 (.012)	.005 (.005)	-	-	190
(15n) ODA, party=3	-.013 (.015)	.009 (.005)	.026 (.017)	-.006* (.004)	155

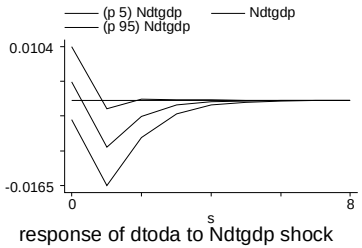
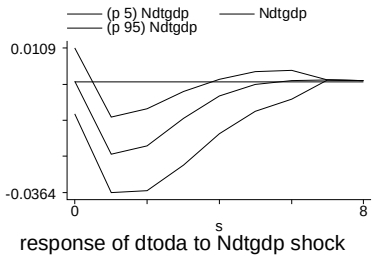
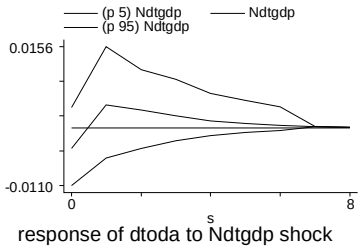
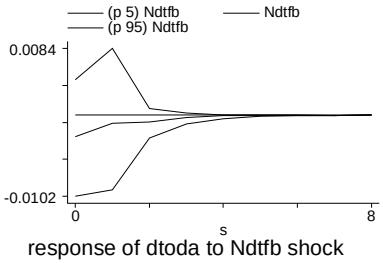
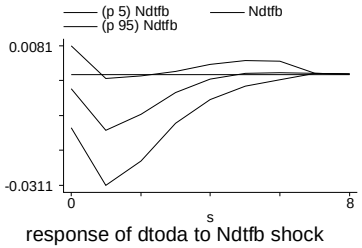
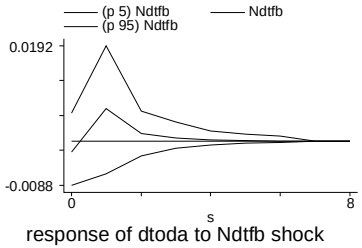
Notes: *** indicates 1 per cent significance level (t-test>2.35); ** 5 per cent (t-test>1.96); * 10 per cent (t-test>1.65); standard errors are in parentheses; party dummy is used to control for political orientation; three variable VAR model is estimated by GMM; country-time fixed effects and common factors are removed prior to estimation.

Source: Author's calculations.

The responses of different types of government to shocks to GDP and fiscal balance in their decision on aid supply vary widely. We observe that both right-wing and centrally aligned governments decrease aid when the economy is affected by a shock, while left-wing governments could increase aid; the result is however not significant for left-wing governments.

The more socialist stance of left-wing parties, as opposed to the more capitalist ideology of right-wing governments seems to be reflected in the result that left-wing governments hesitate to decrease aid in response to shocks, as this would contradict their ideological and political stance. Thence, the variance decomposition (Table 9) yields the conclusion that right and left-wing parties are more ideologically driven in their governance, contrary to the more variable and adaptable behaviour of central governments.

Figure 12: 1-lag VAR impulse response functions of ODA to negative shocks to GDP and fiscal balance under different political orientations of the ruling party

	Ruling party orientation		
	Right	*Center*	*Left*
GDP	 response of dtoda to Ndtgdp shock	 response of dtoda to Ndtgdp shock	 response of dtoda to Ndtgdp shock
Fiscal balance	 response of dtoda to Ndtfb shock	 response of dtoda to Ndtfb shock	 response of dtoda to Ndtfb shock

Notes: Errors are 5% intervals generated by Monte-Carlo with 500 repetitions.

Source: Author's computations.

The PVAR analysis produces evidence supporting politics as a main driver of aid budgetary decisions. Left-wing governments increase or otherwise do not decrease aid as a reaction to a negative shock to GDP or fiscal balance, while both right-wing and central governments will decrease aid. Governments in power are driving aid decisions. After five years, the right-wing parties account for 4.2 per cent of the variations in aid due to shocks to GDP, the centre parties for 21.2 per cent, and the left-wing parties for only 2.7 per cent. This result demonstrates that centre parties' decisions seem more driven by economic conditions while left and right-wing parties tend to follow their ideologies.

Table 9: Forecast Error Variance Decomposition for ODA: Party influence analysis

Variance of ODA as share of GDP explained by negative shock in each variable					
	t=2	t=3	t=4	t=6	t=10
Right wing					
GDP per capita	.039	.038	.041	.042	.042
Fiscal Balance	.022	.036	.036	.036	.036
ODA as share of GDP	.939	.926	.923	.922	.922
Centre					
GDP per capita	.120	.190	.209	.212	.212
Fiscal Balance	.054	.072	.074	.074	.074
ODA as share of GDP	.826	.738	.716	.714	.714
Left wing					
GDP per capita	.022	.024	.025	.028	.029
Fiscal Balance	.049	.061	.063	.062	.061
ODA as share of GDP	.929	.915	.912	.910	.910

Notes: Panel VAR models for three samples: right-wing party (estimation 12n), centre party (estimation 13n) and left-wing party (15n).

Source: Author's calculations.

5.2 Results - the extended model

In this section, we extend the simple three variable panel VAR model of aid, GDP and fiscal balance to account for other possible channels of transmission of unexpected shocks to aid. In the PVAR model:

$$y_{i,t} = A_0 a_{i,t} + L_1 y_{i,t-1} + \cdots + L_p y_{i,t-p} + u_t \qquad (14)$$

Vector $y_{i,t}$ now has at least three and at most six variables among ODA_{it} (aid flows as a share of GDP), GDP_{it} (GDP as a share of population), FB_{it} (fiscal balance), GD_{it} (government debt), $Misery_{it}$ (Misery Index), $Unempl_{it}$ (unemployment), $Infl_{it}$ (inflation), SP_{it} (financial volatility), $FOREX_{it}$ (foreign exchange rate), $Trade_{it}$, and GX_{it} (government expenditures). Results are displayed in Table 10. Robustness checks for such variables as $GDPGR_{it}$ (GDP growth rate), NAT_{it} (net aid transfers) and $ODADR_{it}$ (aid net of debt relief) can also be found in Table 10.

We find that a negative shock to GDP significantly decreases aid after the first year. This result is consistent through all the models (Figure 13). The impulse response of aid to GDP is very persistent and robust to changes in the model specification. A shock to the fiscal balance has a significant and negative effect on aid, but only after the second year. The effect is very robust for all the models. This result supports fiscal stimulus and the room for some flexibility in budget deficit. Governments may react faster to a deterioration of GDP than to changes in fiscal balance, as the fiscal balance can be traded in order to improve the falling GDP, so governments are ready to run a higher fiscal deficit. However this effect is short run; the government introduces a big fiscal stimulus only after the first year. After the second year, in case of a persistent economic shock also affecting the fiscal balance, the government reacts and adjusts aid in response.

The Misery Index has an unexpected positive impact on aid, but this result is insignificant. This is likely driven by inflation. A positive shock to inflation has a positive and consistently significant effect on aid supply. It is surprising and contradictory to some previous studies (e.g. Dang et al. 2009), where a negative relationship between aid and inflation is reported. As inflation decreases the real value of aid, the expected relationship is negative, and increasing inflation should lower aid. Our findings suggest that inflation does not cause any decrease in aid; donors still meet their targets, and inflation is accounted for.

Financial volatility (S&P) has a consistent, negative, and significant impact on aid. Its impulse response function is unstable, indicating a higher level of uncertainty in aid due to financial frictions. Coming to the remaining variables, both shocks to government debt and shocks to unemployment have an expected negative sign, but their coefficients are insignificant. We do not find any significant average effect on trade and government expenditures.

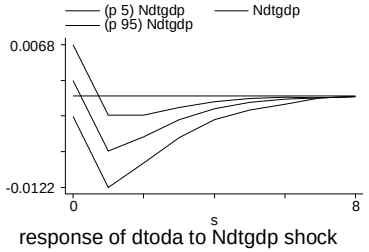
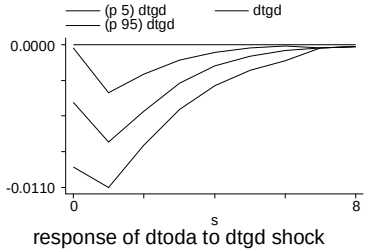
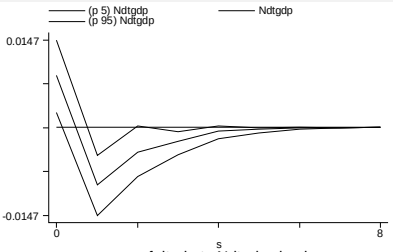
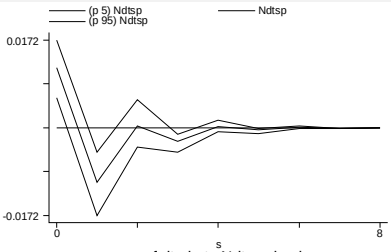
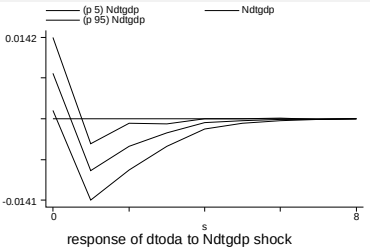
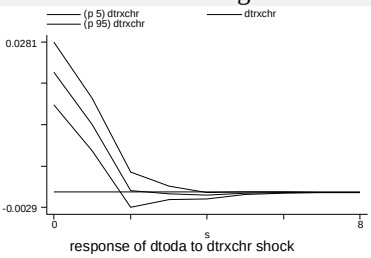
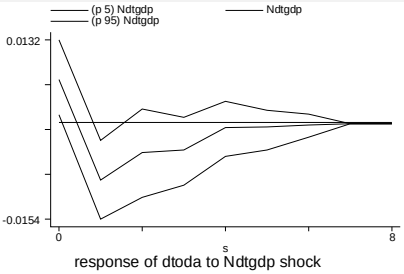
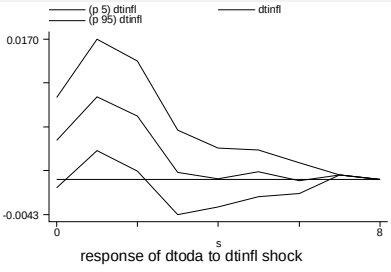
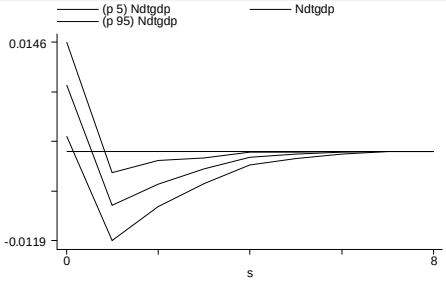
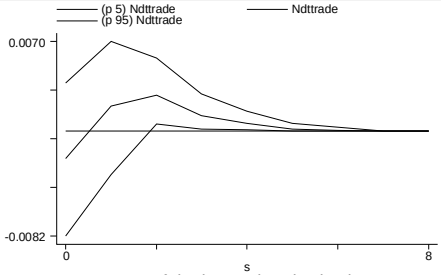
Table 10: Main results for the extended model

	Response to																						Obs.
	GDP_{-1}	GDP_{-2}	FB_{-1}	FB_{-2}	$Misery_{-1}$	$Misery_{-2}$	GD_{-1}	GD_{-2}	$Unempl_{-1}$	$Unempl_{-2}$	Inf_{-1}	$Infl_{-2}$	SP_{-1}	SP_{-2}	$FOREX_{-1}$	$FOREX_{-2}$	$Trade_{-1}$	$Trade_{-2}$	$GDPGR_{-1}$	$GDPGR_{-2}$	GX_{-1}	GX_{-2}	
Shocks	-	-	-	-	+	+	+	+	+	+	+	+	-	-	+	+	-	-	-	-	+	+	
Response of ODA																							
(1n)	-.0149*** (.004)		.002 (.002)																				633
(2n)	-.014*** (.005)	-.001 (.006)	.001 (.002)	-.004** (.002)																			610
1	-.007 (.005)						-.002 (.001)																564
2	-.010* (.005)	-.001 (.006)					-.001 (.001)	-.001 (.001)															541
3	-.015*** (.004)		.002 (.002)		.001 (.002)																		619
4	-.015*** (.005)	-.001 (.006)	.001 (.002)	-.003** (.002)	.001 (.002)	.003** (.001)																	593
5	-.013*** (.005)		.002 (.003)						-.002 (.003)		.001 (.002)												616
6	-.015*** (.006)	.001 (.006)	.002 (.002)	-.003** (.002)					-.002 (.004)	.002 (.004)	.001 (.002)	.003*** (.001)											593
7	-.025*** (.007)		.005 (.004)								.007* (.004)		-.001*** (.000)										388
8	-.024*** (.009)	.010 (.009)	.006 (.003)	-.006** (.003)							.010** (.004)	.010*** (.004)	-.001*** (.001)	-.001*** (.000)									366
9	-.024*** (.007)		.005 (.004)								.008* (.004)		-.001*** (.000)		.002* (.001)								388
10	-.025*** (.009)	.010 (.009)	.006 (.003)	-.006** (.003)							.010** (.005)	.009** (.004)	-.001*** (.000)	-.001** (.000)	.001 (.001)	-.001 (.001)							366
11	-.025*** (.009)	.003 (.009)	.006 (.003)	-.006** (.003)									-.001*** (.000)	-.001** (.000)	.001 (.001)	-.001 (.001)							366
12	-.011** (.005)		.003 (.002)				-.002 (.001)														-.001 (.005)		544
13	-.014*** (.006)	.002 (.006)	.004 (.002)	-.001 (.001)			-.002 (.001)	-.001 (.000)													-.001 (.005)	-.006 (.006)	521
14	-.027*** (.007)		.004 (.003)										-.001*** (.000)		.001 (.001)		.001 (.001)						368
15	-.024*** (.008)	.001 (.008)	.005 (.003)	-.007*** (.002)									-.001*** (.000)	-.001* (.000)	.001 (.001)	-.001 (.001)	.001 (.001)	.001 (.001)					346
16			-.001 (.002)	-.005*** (.002)															-.002 (.001)	-.001 (.001)			614
17			.005 (.003)	-.007*** (.003)							.011** (.004)	.009*** (.004)	-.001*** (.000)	-.001*** (.000)					-.005* (.003)	-.001 .002			369
Response of ODADR (ODA net of debt relief)																							
18	-.028*** (.009)	.002 (.009)	.004 (.001)	-.006** (.003)									-.001*** (.001)	-.001 (.001)									366
Response of NAT (Net Aid Transfers)																							
19	.009 (.007)	-.019** (.008)	.001 (.003)	-.007*** (.003)									.001 (.001)	-.001 (.000)									347
20	.009 (.008)	-.020*** (.009)	-.001 (.002)	-.007*** (.003)					-.001 (.004)	.001 (.004)			.001 (.001)	-.001* (.001)							.006 (.007)	.007 (.009)	346

Notes: ***indicates 1 per cent significance level (t-test>2.35); **5 per cent (t-test>1.96); *10 per cent (t-test>1.65); standard errors are in parentheses; VAR models of up to 6 variables are estimated by GMM; sample: full sample; country-time fixed effects and common factors are removed prior to estimation.

Source: Author's calculations.

Figure 13: Impulse response functions of aid to shocks in selected variables of the extended model

Model number	ODA Impulse Response Functions	
(1)	GDP	Government debt
		
(7)	GDP	S&P index
		
(9)	GDP	Exchange rate
		
(10)	GDP	Inflation
		
(14)	GDP	Trade
		

Notes: Errors are 5 per cent intervals generated by Monte-Carlo with 500 repetitions.

Source: Author's computations.

Table 11: Variance decomposition for the extended model

Variance of ODA as share of GDP explained by a negative shock in each variable after 10 periods

Estimation Variable	2	4	6	8	10	11	13	15	16	17	18	19	20
GDP	.035	.046	.046	.031	.028	.033	.037	.026		.020	.066	.073	.075
FB		.016	.013			.029	.008	.026	.025	.026	.019	.073	.031
Misery		.003											
GD	.026						.020						
Unempl			.009										.003
Inf			.004	.029	.030					.039			
SP				.036	.041	.045		.038		.027	.045	.021	.019
FOREX					.093	.115		.128					
Trade								.006					
GDPGR									.014				
GX							.005						.094
ODA	.939	.934	.928	.876	.779	.778	.930	.776	.961	.889	.870	.833	.778

Source: Author's calculations.

Table 11 exposes the forecast error variance decomposition (FEVD) across variables for the extended PVAR models. We manage to explain almost a quarter of the variations in aid (23 per cent) using other macroeconomic variables, which is substantial and indicates a major relation between the economy and aid decisions. The first row reveals that GDP can explain up to 7.5 per cent of the forecast error variance in aid after ten periods. Fiscal balance explains about 2.5 per cent of the total variation in aid, and government deficit 2 per cent. Financial volatility accounts for up to 4.5 per cent of the variations in ODA. This finding is consistent with Mendoza et al. (2009) who find that stock market volatility in the US is associated with a decrease in aid. We confirm this result for OECD-DAC donors. Another important finding is that a surprisingly large share of variations in aid is due to foreign exchange rate volatility in donor countries, up to 12.8 per cent. The direct effect of falling aid is compounded by the indirect effect of the exchange rates movements. Donors allocate aid in their own currencies and hence the real value of aid may hinge on exchange rates. The financial crisis resulted in the appreciation of the US dollar against many currencies, including the Euro, so if aid from the Eurozone was to stay nominally constant the exchange rate adjustment still leads to a loss of USD 3.9 billion in value in 2009 (World Bank and IMF 2009). Among major donor currencies, only the Japanese yen has appreciated, pushing up the value of Japan's aid contribution. Consistently with Frot (2009) we do not observe any effect that unemployment may have on aid. The Misery Index has no effect either despite Mendoza et al. (2009) having found some evidence that the Misery Index does affect aid. We treat both unemployment and the Misery Index as proxies for the internal social needs of the donor country but unemployment proves insignificant, having negligible power to explain variations in aid. This reveals that foreign aid responds mostly to economic and political shocks, but is insensitive to changes in social conditions.

6 Conclusions

This study investigates the consequences of the financial crisis on aid. We model the effect of different crises on aid from the donor's standpoint using banking crisis data from the 23 OECD-DAC donor countries. We build a theoretical framework based on the consumption model and implement it using panel VAR, first in a simple, three variable form and later in an extended model. Simulations are run on the full sample–to capture recession, on crisis data only–to model stronger crises, and on expansion samples–to simulate mild recession, as well as shock variables before and after the crisis and with a variable to capture political influence.

Foreign aid, an important but variable source of income for developing countries, recently became more volatile. We expose financial and political sources of aid volatility originating from donors that might influence recipients' growth prospects. Variations in aid stem in part from fluctuations in the level of the donor's aid contribution, the share of GDP it decides to allocate to foreign aid.
Our main finding is that crises affect aid budgets and their trend. This influence takes place through two channels: *directly* through lower revenues and *indirectly* by increasing fiscal costs through exchange rates and financial volatility.

We find a positive and significant relationship between aid and GDP. GDP and ODA move in the same direction, and prolonged recessions and banking crises have a lasting and negative effect on the behaviour of donors and aid supply. This relationship between aid and the donor economy is not solely economic as the donor's internal political orientation also plays an important role. Our results suggest that models using just the donors' economic and international strategic interests as determinants of their aid policy may not be complete. Donor countries' own financial conditions as well as political determinants, play important roles in allocating aid budgets, while the social conditions in the donor countries do not. Governments in power are driving aid decisions rather than the needs of people. In particular right-wing and centre governments cut aid in response to economic distress while left-wing governments may not. We also observe that centre parties are more driven by the economic conditions than left and right-wing governments, which tend to make aid budget decisions in accordance with their ideologies.

Results indicate that financial factors matter for aid. Stock market volatility increases aid uncertainty, while exchange rate movements, due to crisis, and the resulting appreciation of the US dollar against other currencies depresses the value of aid. Exchange rate movements have a strong explanatory power of the variation in aid. However, increasing inflation does not contract aid.

The panel VAR approach lets the data speak for itself but fails to offer explanations of the mechanisms beneath the results. Nonetheless, it serves the purpose of deepening our knowledge of the consequences of crises for the developing world. Economic downturns and financial uncertainty do lower the amount of aid allocated to the developing world, and this effect happens through several channels. But economics is clearly not the most influential factor affecting aid allocation; aid is, to a greater extent, affected by politics.

Our results add weight to the concerns of many about falling aid. Decreasing aid amounts to the consequences of recessions spilling over to developing countries; this leads to a call for action on the part of the donor countries.

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