



The effects of EU aid on receiving and sending countries

A modelling approach

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12 November 2012

This report was prepared by the Overseas Development Institute and the National Institute of Economic and Social Research for ONE.

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Summary

The European Union is currently discussing the European Commission's future development aid budget as part of the Multiannual Financial Framework (MFF) over 2014-2020. However, these discussions have largely neglected a discussion on the effects of EU aid for both sending and receiving countries. This study is the first attempt to quantify such effects of EU aid.

EU aid

This paper simulates EU aid channeled through the European Development Fund (EDF) and the Development Cooperation Instrument (DCI) to developing countries. Over the 7 year period 2014-2020, the European Commission proposes that funds through the EDF amount to €30 billion, while those through the DCI would amount to €21 billion. Using current allocation amongst regions, we assume that total funds worth €51 billion over 2014-2020 will be disbursed to regions as follows: around €21 billion in Sub-Saharan Africa; €15 billion in Developing Asia (including Pacific); €5 billion in the Commonwealth of Independent States; and €10 billion in Latin America (incl. Caribbean).

The model, model simulation and model assumptions

We carry out simulations using the National Institute's Global Econometric Model, NiGEM. The NiGEM model has been in use at the National Institute for forecasting and policy analysis since 1987, and is also used by a group of about 40 model subscribers, mainly in the policy community, including the Bank of England, the ECB, the Bundesbank, the OECD and the IMF.

We consider different model simulations of EU aid. Aid can be used for (i) debt reduction, (ii) consumption, (iii) infrastructure,² increased productive capacity with spillovers, and (iv) reducing trade costs.

Our literature review suggests that when directed towards infrastructure, aid raises the capital stock, production possibilities and productivity with a 20 per cent rate of return. In one of the simulations, we assume that 60 per cent of the aid is directed towards infrastructure investment, including social infrastructure, consistent with current DCI and EDF programmes.

The econometric literature finds a positive relationship between Aid for Trade and trade costs. One particular study that estimates the elasticity of trade costs to increased aid for trade is significant and around -0.10. Taking this estimate of the elasticity we calculate that a 60 per cent increase in Sub-Saharan Africa (SSA) aid (equivalent to the simulated €21 billion change) would lead to a decline of around 6 per cent in the costs of exporting or importing.

Effects of EU aid on the EU, aid recipients and the world

² Infrastructure in this report refers to infrastructure investment that contributes to fixed capital formation and we measure it by spending on economic and social infrastructure in EU aid statistics.

In the final, combined scenario considered in this paper, we simulate the effects of EU aid assuming that 60 per cent of aid will be directed towards economic and social infrastructure (as is the case at present) and that EU aid for trade is used to reduce trade costs. In this scenario, export and import prices in all the EU donor countries are estimated to fall by between 0.3-0.9 per cent. They also fall in recipient regions which facilitates trade.

In the combined scenario, output at the global level is expected to be 0.2 per cent higher by 2020 as a result of EU aid. This is equivalent to a rise in the level of global output of nearly €400 billion, with large global gains in employment.

At the EU-wide level, we expect the level of output to be 0.1 per cent higher by 2020. Thus the gains from the rise in trade and decline in trade costs are expected to outweigh the losses due to the deterioration of current account balances and rise in government borrowing needed to finance the aid. EU aid is an investment in itself. Within the EU, the biggest impacts on GDP are expected to materialise in Portugal and Hungary.

Output in Sub-Saharan Africa would be 2.5 per cent higher, and output in the other developing regions would be expected to rise by $\frac{1}{4}$ - $\frac{3}{4}$ per cent after 10 years. This is based on an assumption of a 20 per cent social rate of return (rise in economy-wide productivity) if aid is channelled effectively in the recipient countries.

In more than half of the countries we would expect tax rates to actually decline as a result of the aid flows, despite the initial rise in government debt required to finance the aid.

By 2020, the value of world trade would be expected to rise by €120 billion as a result of the aid flows, and also by 2020 global gains in employment are expected to fall within the range of 600,000-3,000,000.

Conclusions

This paper simulates the effects of €51 billion EU aid (EDF and DCI) on sending and receiving countries over the period 2014-2020. It considers various scenarios. One scenario assumes that 60 per cent of EU aid is directed towards productive capacity enhancing economic and social infrastructure, and efforts to reduce trade costs, with the rest of aid boosting consumption. Using findings from the empirical literature on the impact of aid to economic and social infrastructure on productivity and aid for trade on trade costs, and simulating the effects of aid on NiGEM, a commonly used model in the EU, we conclude that EU aid is an investment benefitting poor countries, the world generally, and the EU as a sender of aid in particular. Under a reasonable set of assumptions, over the 7 year period of the next EU budget, the €51bn investment in development aid would be completely recouped by EU taxpayers, and the effects on the ground would give a clear return on investment. In that time European and global GDP levels will receive a boost of almost 0.1 per cent and over 0.2 per cent respectively, with much stronger benefits accruing to the aid recipient regions.

1 Introduction

The European Union (Member States and the EU institutions) are currently negotiating the EU's next Multiannual Financial Framework (MFF) over 2014-2020. These discussions cover areas such as the EU's Cohesion Policy and Common Agricultural Policy, but also how much will be spent on aid to developing countries. Whilst there are ongoing discussions on EU spending on CAP and social cohesion, there are comparatively fewer discussions on the effects of EU aid for both sending and receiving countries.

Whilst there have been various qualitative assessments of EU aid (OECD, 2012; House of Commons, 2012), this paper examines the quantitative effects of EU aid (specifically the European Development Fund and the Development Cooperation Instrument totalling €51 billion over 2014-2020). We believe this is the first study that quantifies the potential effects of proposed EU aid on both sending and receiving countries. It reviews the literature on EU aid and the effects of aid generally. It uses this to derive possible effects of EU aid which are subsequently modelled in a well-known general equilibrium model, which is used by the European central banks and ministries of finance.

So far, the literature has tended to focus mostly on effects of aid on receiving countries (Rajan and Subramanian, 2011; Tarp, 2009), but EU providers themselves are also affected by aid in two ways. First, aid needs to be financed. And secondly, when managed well, EU aid can lead to higher output in receiving countries which will lead to a rise in imports, including from the EU.

This paper shows that that based on plausible assumptions, EU aid is actually an investment that can lead to positive net effects on output in the EU as well as in recipient regions. By the end of the MFF period, the EU is expected to have gained 0.1 per cent of GDP, even taking into account the higher financing needs in the EU itself.

The structure of this paper is as follows. Section 2 describes EU aid and reviews the literature on the potential effect of (EU) aid. Section 3 provides the modelling set-up, assumptions and results. Section 4 concludes.

2 EU aid, developing country growth and home country effects

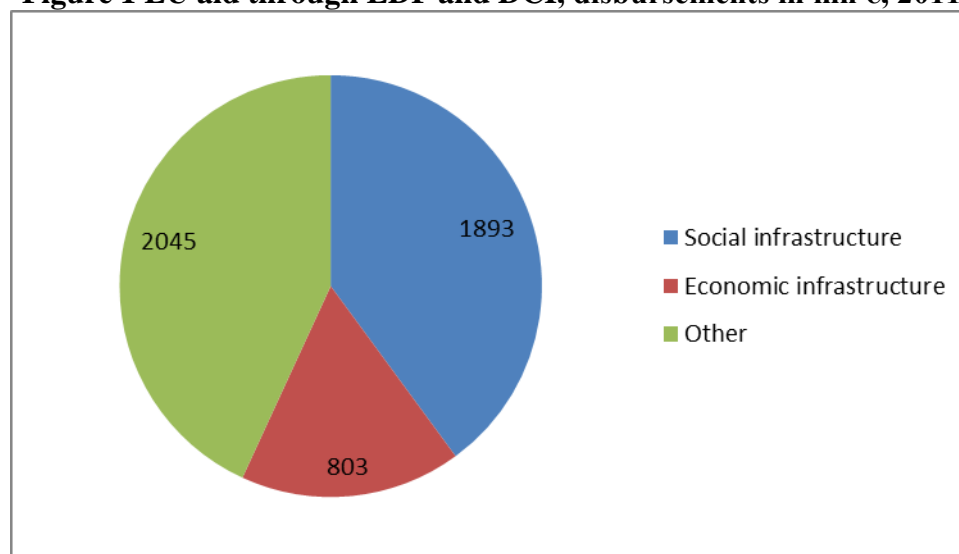
This section describes current and proposed EU aid (2.1), reviews the literature on the potential effect of (EU) aid on developing country growth (2.2), and the potential links with EU economic performance (2.3).

2.1 EU aid

The EU institutions and the EU member states together provide over 50% of the world's Official Development Assistance (ODA). OECD (2012) further suggests that based on the grant programme, the EU institutions were the third largest DAC donor. The EU employs various aid instruments both on the budget and off-budget. This paper is concerned particularly with two aid instruments that are targeting the poorest and most vulnerable economies: the European Development Fund (EDF) and the Development Cooperation Instrument (DCI).

Figure 1 shows the sectoral breakdown of EU aid through the EDF and DCI in 2011. A large proportion, nearly 60%, of EU aid (€1893mn plus €803mn, or 57%) from a total of €4741mn) goes to infrastructure (incl. transport, communications, energy, water and other infrastructure such as health and education included in social infrastructure).

Figure 1 EU aid through EDF and DCI, disbursements in mn €, 2011



Source: Calculations based on Table 5.19 (p.196) in DEVCO Annual Report 2012 (adding spending on EDF and DCI thematic and geographic programmes)

The Commission's June 2011 proposals for the MFF for the period 2014-2020 are based on the publication “A Budget for Europe 2020”. The EU remains committed to achieving the target of Official Development Assistance (ODA) of 0.7% of Gross National Income (GNI) by 2015. The EU aims to step up the financing for external action on the budget from €56.8 billion to €70 billion with an increased use of innovative financial instruments (such as loans, guarantees, equity and risk-sharing instruments). Of this, some €21 billion has been reserved for the Development Cooperation Instrument. The European Development Fund (EDF) for 79 African, Caribbean and Pacific (ACP) states will, it is proposed, increase from €23 billion for six years to €30.3 billion for seven years (in 2011 prices). The total of the EDF and DCI amounts to €51 billion.

The EU has commissioned a series of evaluations by aid instrument, theme or region.³ There have also been a number of recent independent assessments of EU aid. The UK's Department for International Development (DFID) conducted the Multilateral Aid Review (MAR) in 2011 and more recently the UK House of Commons (2012) examined the comparative advantage of EU aid versus aid through the UK. The House of Commons report in particular argues there are a number of advantages of the EU as a conduit for development assistance:

- it acts as a channel for Member States which have not previously provided development assistance;
- some Member States would spend even less on aid were it not for the European Commission, thus there is overall higher spending on aid than would otherwise be the case;
- it is able to operate large-scale regional programmes;
- it operates in sectors where other Member States rarely do – for the UK this includes road building;
- it has a presence in countries where other Member States do not have a bilateral programme. The DFID review states that this enables the UK to play a part, through its contribution to European Commission funding, for example to development cooperation in Niger and Haiti.

These reports also note a number of areas where EU development assistance needs to be improved. The European Commission's administrative costs (5.4 per cent of total aid disbursements) are twice those of the UK Department for International Development (DFID) (2.7 per cent), although not higher than multilaterals, e.g. 10 per cent for IDA. The Multilateral Aid Review however considers the European Development Fund in particular as “very good value for money” for achieving UK development objectives.

The Quality of Official Development Assistance (QuODA) index developed jointly by the Center for Global Development and the Brookings Institution's Center for Global Economy and Development also ranks the EU institutions highly on aid effectiveness. It provides a comprehensive assessment of donor aid quality across four dimensions: (1) ‘Maximising Efficiency’; (2) ‘Fostering Institutions’; (3) ‘Reducing the Burden on Recipient Countries’; and (4) ‘Transparency and Learning’. For each

³ http://ec.europa.eu/europeaid/how/evaluation/evaluation_reports/index_en.htm

dimension, QuODA aggregates a number of indicators – 31 in total – which reflect international effectiveness standards. The EU institutions score higher than the mean when compared to EU15 donors on all areas, and come out first on the ‘Transparency and Learning’ indicator.

OECD (2012) argues that since the 2007 peer review, the EU institutions have taken positive steps to make the programme more effective and increase its impact. These steps include major organisational restructuring; efforts to streamline financial instruments; and a strategic approach to making co-operation more co-ordinated and aligned. However, the EU institutions need to make more progress in a number of areas. In completing the reorganisation of EU structures brought about by the Lisbon Treaty they need to be clear about the responsibilities of each institution as they work together to implement the development co-operation programme. They should also do more to demonstrate and communicate results.

Surprisingly, there are very few quantitative assessments of EU aid on partial or general equilibrium effects so we actually know very little about the effects of EU aid, so policy makers have a very weak evidence base on which to make decisions. In the rest of this paper, we aim to address this by reviewing the quantitative evidence, the possible effects of aid and then in section 3 simulating the effects of EU aid.

2.2 Aid, investment and growth

As mentioned in Barrell et al (2009) there is a large macro-econometric literature on the macro relationships amongst aid, growth and investment. The evidence is mixed. On the one hand a number of studies cannot find a positive, significant effect of aggregate aid. Using a large panel of countries and an instrumentation strategy to correct for the bias in conventional OLS estimation, Rajan and Subramanian (2007) do not find any positive relationship between aid and growth. After analysing 97 different empirical studies on the impact of aid on growth, Doucouliagos and Paldam (2007) conclude that the impact of aid on growth is not significant. A number of factors may explain the inconclusiveness of these research efforts. Bourguignon and Sundberg (2007) argue that these mixed results are not surprising given the heterogeneity of aid motives and the complex causality chain linking foreign aid to growth.

However, recent and more detailed studies do find a positive effect of aid. Reviewing the most recent evidence on aid including the latest econometric methods and specifications, Tarp (2009) argues that “evidence indicates that sustaining foreign assistance programs at reasonable levels can be expected to enhance the living standards of the world’s poorest people. Abolishing foreign aid, or drastically cutting it back would be a mistake and is not warranted by any reasonable interpretation of the evidence.” Arndt, Jones and Tarp (2009) show that the average treatment effect of aid on growth is positive in the 1960-2000 period. The long run elasticity of growth with respect to the share of aid in recipient GDP appears to be around 0.2. Tarp (2009) argues that this is consistent with the view that foreign aid stimulates aggregate investment and also may contribute to productivity growth, despite some fraction of aid being allocated to consumption.

Indeed, the impact of aid tends to vary by type. McPherson and Rakowski (2001) use a multi-equation system and find that the impact of aid on GDP per capita growth is positive but indirect through investment. Also emphasising that aid affects growth through investment, Gomanee, Girma and Morrissey (2002) find on the basis of 25 sub-Saharan African countries over 1970-1997 that each one percentage point in the ratio of aid to GNP contributes one-third of one percentage point to growth. Clemens *et al.* (2004) split aid into different types and identify the type of aid that could plausibly stimulate growth in the short-run. They include budget and balance of payments support, investments in infrastructure, and aid for productive sectors. They find a large positive effect of this type of aid on short-term growth: a US\$1 increase in aid raises the present value of output by US\$8, although this effect is decreasing at the margin. By focusing the analysis on aid via investment (infrastructure, agriculture, energy efficiency), we can depart from the aid-growth conundrum by isolating the impacts of specific types of aid which have been found to be more effective.

Much of the literature on the effects of investment in infrastructure estimates rates of return using macroeconomic growth regressions. Barrell et al (2009) survey several estimates. For example, Estache (2006) suggests that *economic* returns on investment projects average 30–40 per cent for telecommunications, more than 40 per cent for electricity generation, and more than 200 per cent for roads but when the outliers are excluded, the average is about 80 per cent for roads. Returns tend to be higher in low-income than in middle income countries (see Canning and Bennathan, 2000, and Briceño and others 2004). Table 1 provides the social rate of returns on World Bank projects in infrastructure and we take this to be around 20 per cent. This estimate will be taken forward in the next section.

Table 1: Social Rates of Return on World Bank Projects
Unweighted Average 1960–2000

Region	Energy/ Mining	Telecoms & Information	Transport	Urban	Water & Sanitation
Africa	14.1	20.6	25.5	21.3	7.5
East Asia	18.3	19.5	24.8	20.3	10.5
Eastern Europe	30.9	31.1	25.8	15.7	9.8
Latin America	12.8	16.6	22.4	19.2	11
Middle East	12.3	26.9	25.1	16.5	7.8
South Asia	23.2	22	24.1	14.9	9.8
Developing	18.4	21.5	25.4	19.2	9.2
World					

Source: C. Briceño, Estache, N. Shafik (2004)

The EU is the largest provider of Aid for Trade which includes e.g. trade related technical assistance and infrastructure. Whilst there are no quantitative studies that examine the effectiveness of EU aid for trade (Te Velde et al 2006), there are now several studies examining the impact of Aid for Trade (Basnett et al , 2012). For example, Bearce et al (2010) suggest that a US\$ 1 investment of total US government assistance to trade on average would increase exports between US\$42-53.⁴

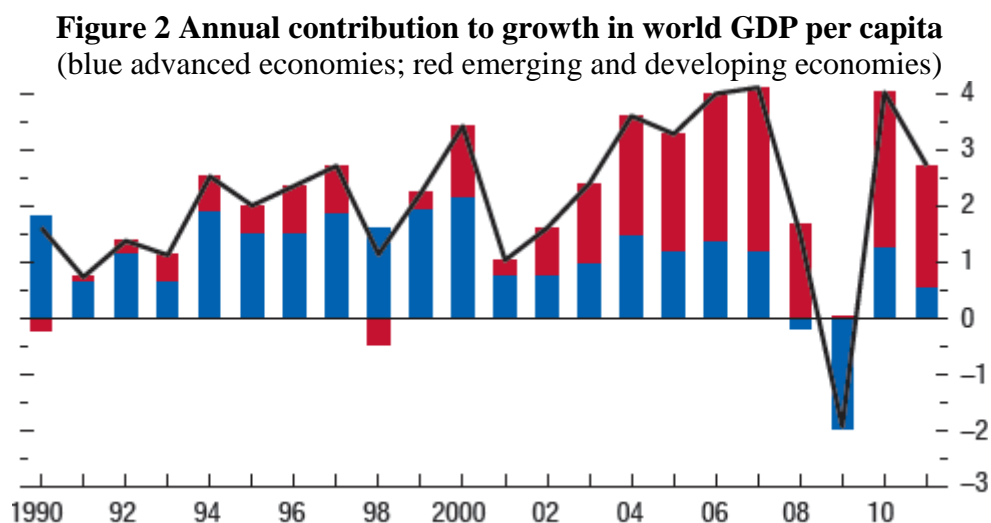
⁴ http://pdf.usaid.gov/pdf_docs/PDACR202.pdf

Ferro *et al* (2011) examine the impact of aid for trade on the manufacturing and services sectors. They find that a 10 per cent increase in aid to transportation, ICT, energy, and banking services is associated with a 2 per cent, 0.3 per cent, 6.8 per cent, and 4.7 per cent increase of manufacturing exports in receiving countries, respectively. Aid to the business service sector is positive but not statistically significant. They also include regional estimations, e.g. in Sub-Saharan Africa, aid to energy, ICT, and banking had the largest statistically significant impacts on manufactured exports, with a 10 per cent increase in aid associated with increases of manufactured exports of 6.37 per cent, 4.83 per cent, and 2.23 per cent, respectively (and greater than in most other regions).

Cali and te Velde (2011) examine the impact of aid for trade and trade costs and exports. They found that a US\$1 million increase in aid for trade facilitation is associated with a 6 per cent reduction in the cost of packing, loading, and shipping to the transit hub. The estimations (column 4 of table 3 in their publication) find that the elasticity of trade costs to increased aid for trade is significant with a value of around -0.10. Taking this elasticity we can calculate that a 60 per cent increase in SSA aid (which corresponds to the simulations in the next section) would lead to a decline of around 6 per cent in the costs of exporting or importing.

2.3 EU aid and European performance

We live in an interdependent world and growth in developing countries is also good for others. The benefits of faster growth in developing countries, in part due to EU aid as per the previous section, are non-economic (less conflict and more stability, fewer communicable diseases, etc.) but also economic. Emerging and developing economies have been leading global growth for a decade (IMF, 2012) as shown in Figure 2. This growth in the poorest countries has also stimulated demand and imports into their economies. For example, EU27 exports to a sample of the 36 low income countries increased by 125 per cent over the decade to 2010, equivalent to an additional US\$12 billion (or €9.2 billion) of exports each year (UN Comtrade data).



Source : IMF World Economic Outlook October 2012

Moreover, there is a relationship between bilateral aid and bilateral exports, not because aid is tied but because aid can lead to additional growth and imports. Te Velde and Massa (2008) estimate the partial equilibrium effects of bilateral aid loans and aid grants on exports based on a sample panel of all DAC providers of aid and all DAC developing country receivers over the period 1980-2006, taking into account fixed country effects as well as other normal determinants of bilateral trade such as GDP, trade, distance and language ties (see the appendix for regression results). They quantify the impact of additional aid flows (grants or loans) on exports. They first take bilateral exports and aid data, shock aid by US\$ 1 million in each donor (which is around 0.01 per cent for each donor), multiply the increase in aid by 0.025 such as France, Germany and Japan (which is approximately the coefficient in the pooled and more reliable regression in the random effects model examining the relationship between bilateral aid and bilateral trade) and then estimate the relative and absolute changes in exports. Table 2 shows the results which suggest that a one million change in bilateral aid would lead to an increase of bilateral exports of a third of a million (France) but three quarters of a million in Germany and Japan. So Germany is expected to a major beneficiary of giving of bilateral aid (as recorded in the OECD DAC database).

Table 2 Approx. effects on export flows of a 1 million US\$ increase in aid flows

Country	2006: Value of exports of goods to non-OECD countries	2006: Value of bilateral ODA (net disbursements)	Share of USD 1mn in ODA	Value of exports change (USD mn)
France	98448	7919.38	0.013%	0.31
Germany	212398	7034.08	0.014%	0.75
Japan	315875	10385.17	0.010%	0.76

Source: Massa and Te Velde (2009). OECD DAC and IMF DOTS; changes of aid multiplied by 0.025 (cf the regression results) to obtain effects on trade.

3 Policy scenarios and model description

3.1 *Simulating the effects of EU aid*

In this section we assess the impact of EU aid through the EDF and DCI programmes on both the donor and recipient countries. The analysis is carried out through a series of model simulations, using the National Institute's Global Econometric Model, NiGEM. The NiGEM model has been in use at the National Institute for forecasting and policy analysis since 1987, and is also used by a group of about 40 model subscribers, mainly in the policy community, including the Bank of England, the ECB, the OECD and the IMF. Most countries in the OECD are modelled separately, and there are also separate models of China, India, Russia, Hong Kong, Taiwan, Brazil, South Africa, Estonia, Latvia, Lithuania, Slovenia, Romania and Bulgaria. The rest of the world is modelled through regional blocks so that the model is global in scope⁵. The regional groups are consistent with IMF country groups, as defined for the World Economic Outlook database, except that they exclude countries that are modelled individually within NiGEM. Below we look at the impact of the flow of aid to the regions defined as Sub-Saharan Africa, Latin America and the Caribbean, Developing Asia and the Commonwealth of Independent States.

All country and regional models in NiGEM contain the determinants of domestic demand, a supply side, export and import volumes, prices, current accounts and net foreign assets. Output is determined in the long run by factor inputs and technical progress interacting through production functions, but is driven by demand in the short- to medium-term. Economies are linked through trade, competitiveness and financial markets and are fully simultaneous. Further details on the NiGEM model are available at <http://nimodel.niesr.ac.uk/>.

Foreign aid flows through the current accounts, with a negative effect on current account balances in the donor countries and a positive effect on current account balances in the recipient countries. This has implications for the accumulation of foreign assets, as the size of the current account balance must equate to the change in the net stock of foreign assets in each country (after allowing for any revaluation effects). Aid recipients will see an improvement in their net foreign asset position, while donors will see a deterioration. In US\$ terms, the direct net rise in recipient assets will roughly equal the direct net decline in donor net assets. However, if a large economy sends aid to a smaller economy, the gains in the recipient country in percentage terms would be high relative to the losses in the donor country. On top of this, purchasing power matters. If €1 can buy more in the recipient country than it can buy in the sending country, there is a net gain from the transfer at the global level, even before allowing for any of the factors such as trade expansion that we explore further below.

The aid must be financed from somewhere, and in the scenarios below we will assume that the aid flows are financed by a temporary rise in government debt in the donor countries, which must at some point be repaid. NiGEM operates with a tax rule

⁵ See Appendix A for details on the composition of regional groupings.

in place to ensure that governments remain solvent. Any rise in government debt will induce an endogenous response in the rate of income tax, in order to bring the fiscal position back in line with its target. This ensures that the deficit and debt stock return to sustainable levels after a shock. This implies that aid outflows entail future income tax liabilities, and so without allowing for any additional impacts through trade or prices would have a negative impact on output in the donor economies. But later we will have a more realistic picture that includes the effects of aid on other factors.

The impact of aid on both the recipient and donor countries depends on how the funds are spent. If the funds are spent purely on paying down outstanding debt, there is little impact on either country, as demonstrated by Barrell *et al* (2009). In the first scenario we look at in the next section, we consider the impact of aid that is directed in this way. This can be expected to have limited impact on trade and the full costs of the aid flows will ultimately be borne by the taxpayer in the donor countries. However, we will demonstrate that well-directed aid will entail little or no costs to the taxpayer, and can even benefit taxpayers in the donor countries. If the funds are spent on current consumption, such as supporting social safety nets, there will be a short-term stimulus to demand in the recipient countries. This in turn will raise demand for imported goods within the recipient, and so support exports from the rest of the world, including the donor countries. This will offset and may outweigh the direct costs of the aid to the donor countries.

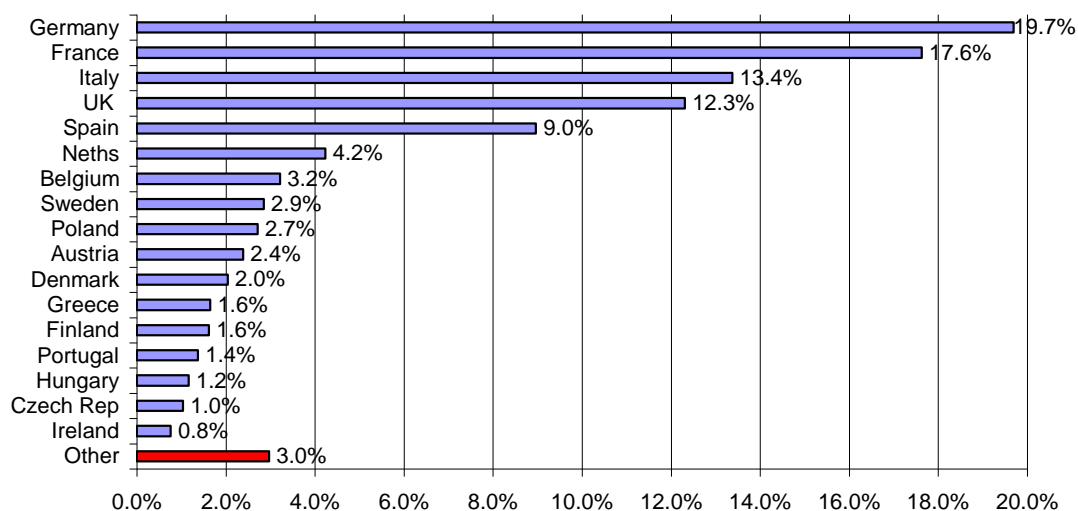
If the aid is spent on productive investment, this will raise the available capital stock within the recipient countries, and have a permanently positive effect on the level of potential output, whereas when spending is spent purely on current consumption the effects would be expected to largely dissipate within a few years of the transfer, unless the rise in consumption stimulates domestic investment. If aid can be channeled into productive investment, this will have a longer-lasting impact on output in the recipient countries, although the short-term effects may not differ significantly from spending on current consumption. The long-term rise in productive capacity in the recipient countries will be more likely to have a positive impact on the donor countries, who gain from a longer-term rise in exports to the recipient countries.

Some investment is more productive than others. Infrastructure investment has been identified as one of the crucial areas towards which to direct aid, as the benefits to both the recipients and donors are likely to be large. This raises the speed of the adoption of technology from the advanced economies and reduces the costs of distribution of all products, produced for both domestic and external markets. Briceno *et al* (2004), for example, suggest a social rate of return on investment in transport infrastructure of about 20 per cent in emerging and developing markets (see table 1 above). This means that in addition to the rise in the capital stock driven by the investment, productivity on a broader level rises as well. Cali and te Velde (2009) suggest that aid designated for trade facilitation can have a marked effect on trade prices, reducing the costs of exports from the recipient countries. This raises the competitiveness and demand for recipient exports and also reduces import costs for the rest of the world. Trade facilitation can also reduce the import costs in the recipient country of goods from the rest of the world, which should have a net positive impact on world trade and global demand.

As discussed in section 2, our simulation studies are based on a flow of funds channeled through the EDF and DCI programmes to Sub-Saharan Africa, Latin America and the Caribbean, Developing Asia (incl. Pacific) and the Commonwealth of Independent States. The total magnitude of the aid amounts to €51 billion, spread evenly over the seven-year period. This equates to €3 billion per annum to Sub-Saharan Africa, €2.1 billion per annum to Developing Asia (including Pacific), €0.7 billion per annum to the Commonwealth of Independent States and €1.4 billion per annum to Latin America and the Caribbean. We assume that 40 per cent of the funds are directed towards supporting current consumption and production, while 60 per cent is directed towards social and economic infrastructure investment. Improved infrastructure is expected to raise productivity, and we allow a 20 per cent social rate of return on the investment in infrastructure (see section 2), introduced gradually over the seven-year period.

We distribute the outflows across the donor countries, based on their share of total contributions to the DCI in 2011 and the proposed future contributions to the EDF. The share of the total €51 billion in aid flows that is attributed to each donor country is illustrated in figure 3.

Figure 3. Share of EDF and DCI financed by each donor⁶



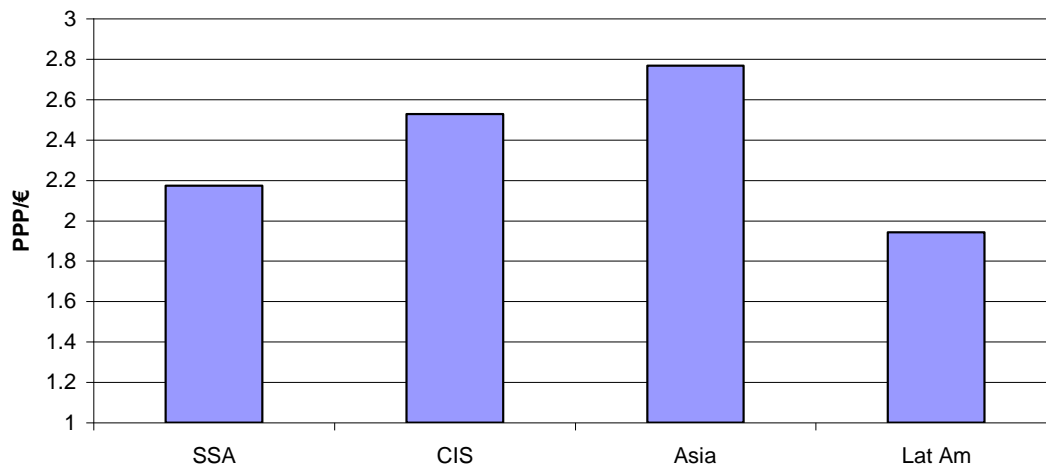
Source: Authors calculations based on European Commission's Financial Report 2011 and European Commission's 2011 proposal for an internal agreement on the 11th European Development Fund.

The impact of aid in the recipient regions will depend on the purchasing power of the transfer in the recipient countries. In order to calibrate the impact on domestic expenditure, the euro value of the aid must be translated into the purchasing value

⁶ 'Other' refers to the following set of countries: Estonia, Latvia, Lithuania, Slovenia, Slovakia, Romania, Bulgaria, Malta, Cyprus, Luxemburg. Together they contribute 3 per cent of the total. In the analysis below we do not model aid outflows from these 10 countries directly, due to model limitations. Instead, the 3 per cent of aid flows is distributed proportionately across the 17 donor countries included in the scenario. We have also not included Croatia in the analysis, which is due to join the EU in 2013. Given its small size, this omission will have negligible impact on the presented results.

within the recipients. The conversion is calculated using the 2005 ratio of GDP in purchasing power parity (PPP) exchange rates to GDP in current US\$ in each region, from the IMF WEO database. This ratio is illustrated in figure 4. The figure shows that €1 is worth at least €2 in the recipient countries, and up to €2.8 in the Developing Asia region. This suggests that there are substantial gains to be made at the global level from transfers from the EU to developing and emerging economies simply due to the purchasing power effects. As we illustrate below, these positive effects are strengthened through enhanced trade and productivity developments.

Figure 4 Purchasing power parity relative to euro exchange rate



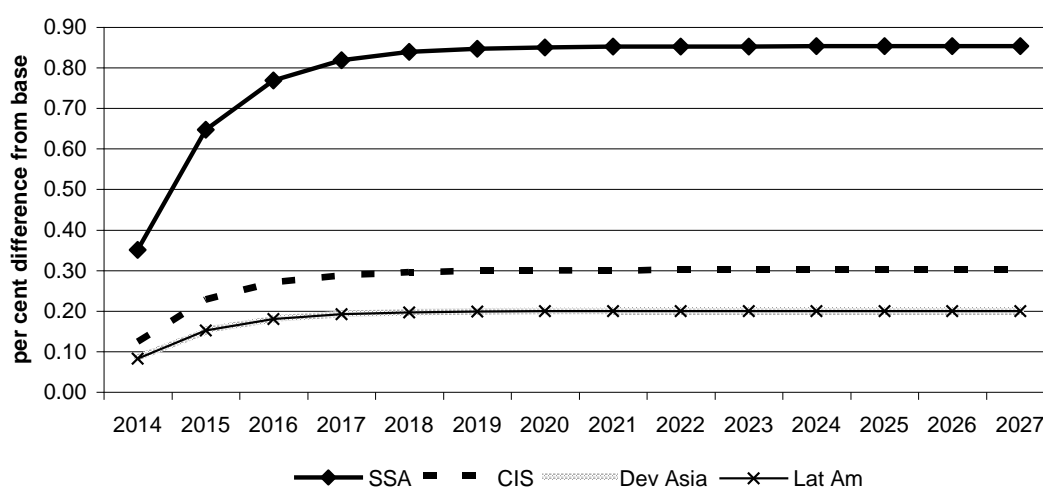
Source: Derived from IMF World Economic Outlook database

In order to calibrate the impact of investment on the long-run capacity of the region to produce, we need to consider two channels. The first is the contribution to the capital stock. This requires an initial assumption as to the quantity of existing capital in each region and an estimate of the expected rate of depreciation of the investment. The second is the expected “social rate of return” on the investment, or the spillovers to the rest of the economy through reduced distribution costs and the like.

We base our estimate of the initial magnitude of the existing capital stock in each recipient region broadly on the estimates reported in Nehru and Dhareshwar (1993). This points to a capital output ratio averaging 2.6 in Sub-Saharan Africa, 2.8 in Developing Asia and 3.0 in the Commonwealth of Independent States and the Latin America and the Caribbean region. We assume a 10 per cent rate of depreciation per annum of the new investment. While this is somewhat lower than estimates reported by some studies, such as Bu (2006), it is higher than usual estimates for the rate of depreciation for advanced economies. Given these assumptions, and an estimate that 60 per cent of the aid will be directed towards investment (the sum of social and economic infrastructure, see section 2), this allows us to calculate the impact of capital accumulation on the potential level of output in each recipient region.

Figure 5 illustrates the expected impact of the aid on potential output that is expected as a direct result of capital accumulation. The aid flows would raise potential output in the Sub-Saharan Africa region by about 0.85 per cent, the Commonwealth of Independent States region by about 0.3 per cent and the Developing Asia and Latin American and Caribbean regions by about 0.2 per cent.

Figure 5 Impact of capital accumulation on potential output



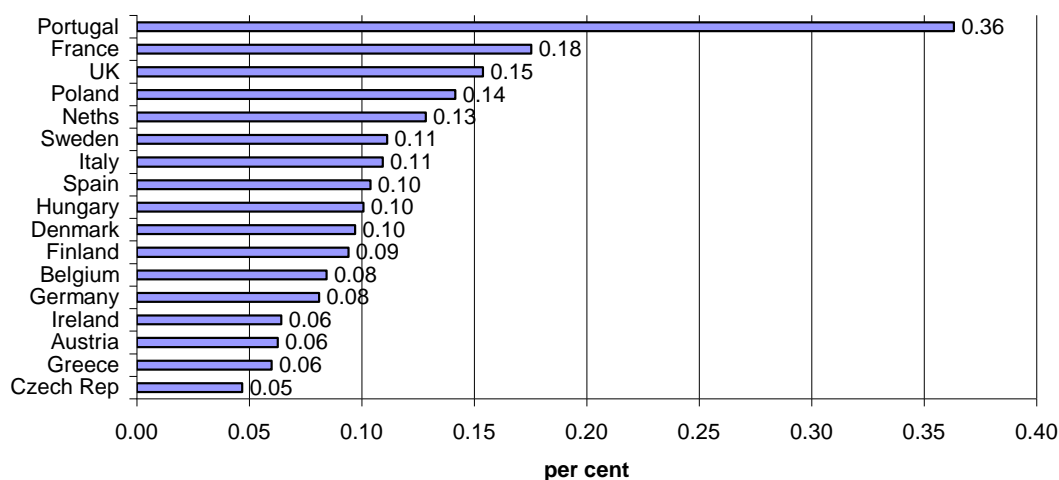
We estimate that the investment has a 20 per cent social rate of return, a conservative estimate in line with rates reported by, for example, Briceno *et al* (2004). This means that the direct effects of capital accumulation on potential output in each region, illustrated in figure 5, are augmented by a further 20 per cent through productivity gains. Based on this assumption, trend productivity is expected to rise by 0.17 per cent in Sub-Saharan Africa, by 0.06 per cent in the Commonwealth of Independent States and 0.04 per cent in Developing Asia and Latin America and the Caribbean⁷. This is implemented as a gradual rise over the seven-year period.

Cali and te Velde (2009, 2011) demonstrate that investment directed towards trade facilitation can significantly reduce the costs of trading with the recipient regions. Based on their estimates, if the aid flows are directed towards infrastructure investments that facilitate trade, this would be expected to reduce export prices from Sub-Saharan Africa by about 6 per cent over the seven-year period. Using this as a benchmark figure, we calibrate export price declines in the other regions by assessing the magnitude of the planned aid inflow relative to total exports from each region. This implies a 2 per cent decline in export prices from the Commonwealth of Independent States, a 1.3 per cent decline in export prices from Latin America and the Caribbean and a 1 per cent decline in export prices from Developing Asia.

Trade facilitation should also mean that exporting to the aid recipient regions becomes less expensive. We calibrate the implied decline in export prices from the EU countries according to their share of exports directed towards each of the aid recipient regions. Figure 6 illustrates the expected decline in export prices relative to baseline in each of the EU donor countries included in the scenario. Portugal stands out as expecting the most significant decline in trade prices, due to the high share of exports sent to the regions. Portugal sends more than 5 per cent of its total exports to Sub-Saharan Africa and more than 2 per cent to Developing Asia. The Czech Republic, Greece, Austria and Ireland, on the other hand, conduct relatively little trade with the regions, and have less to gain in terms of trade facilitation.

⁷ This is simply calibrated as 20 per cent of the estimated rise in the capital stock in each region.

Figure 6 Estimated decline in export prices by 2020



All of the simulations reported below are based on the following underlying model assumptions. We use the July 2012 version of NiGEM (v3.12b), with all simulations starting in 2014Q1. The default version of the model was used, which allows for forward-looking behaviour in exchange rates, long-term interest rates and equity prices. The major central banks are assumed to follow an interest rate setting rule, which targets inflation and nominal GDP. Fiscal solvency is imposed, which ensures that the government budget deficit in each country returns to baseline.

3.2 Simulation results

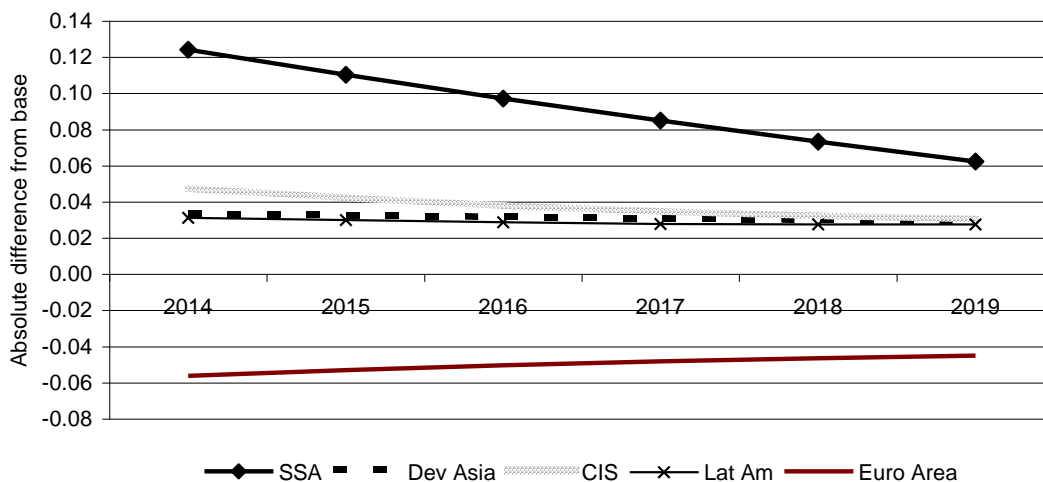
The main scenario that we consider is the impact of the flow of aid from EU countries to four recipient regions over the period 2014-2020. As detailed above, the total magnitude of the aid amounts to €51 billion, spread evenly over the seven-year period. This equates to €3 billion per annum to Sub-Saharan Africa, €2.1 billion per annum to Developing Asia, €0.7 billion per annum to the Commonwealth of Independent States and €1.4 billion per annum to Latin America and the Caribbean. We assume that 40 per cent of the funds are directed towards supporting current consumption and production, while 60 per cent is directed towards infrastructure investment. Improved infrastructure is expected to raise productivity, and we allow a 20 per cent social rate of return on the investment in infrastructure, introduced gradually over the seven-year period. We also allow for trade facilitation to reduce export costs from the recipient countries, as well as export costs to the recipient countries. Below we build-up the scenario gradually, in order to identify the sources of key impacts related to the aid flows.

Direct effect of aid flows on current account and public finances

We begin by illustrating the direct effects of the aid flows through the current account and public sector balances. In this scenario, funds are transferred from the EU to the recipient regions, but are not spent on anything. This could be interpreted as debt relief.

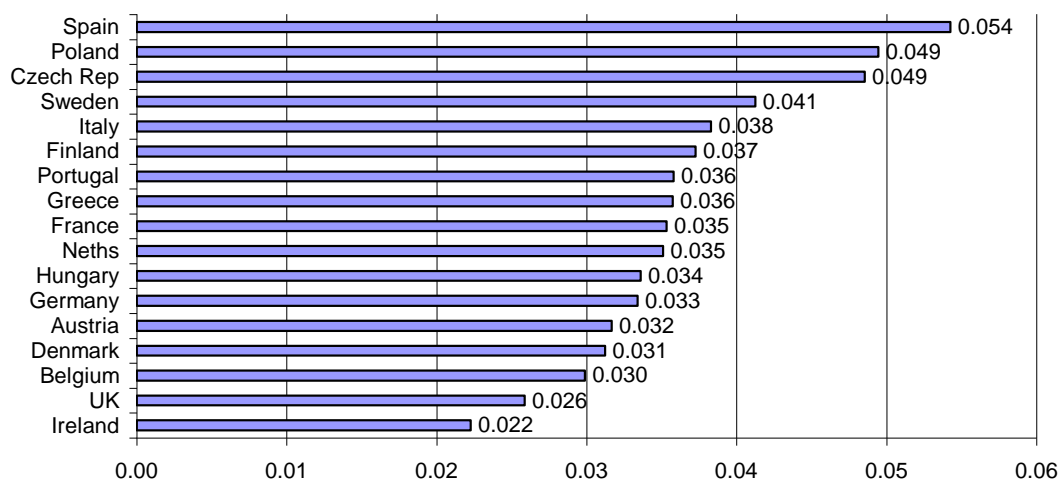
As illustrated in figure 7, the current account balances in the recipient regions improve slightly (by up to 0.1 per cent of GDP), while there is a small worsening of balances within the donor region. This is matched by a modest accumulation of net foreign assets in the recipients, reaching 0.4 per cent of GDP in Sub-Saharan Africa by 2020 with small impacts elsewhere.

Figure 7 Impact of aid flows on current account balances (% of GDP)



If the aid is financed by issuing government debt, this must be repaid at some point in the future. We assume that this repayment is effected through income taxes. Figure 8 illustrates the estimated rise in the income tax rate by 2020 that would be needed in each country to pay back this debt. The rise would be temporary and would dissipate over the next few years as the debt is repaid. This is based on the assumption that the aid is directed simply towards paying off existing debt of the recipient countries. Aid directed in this way can be expected to have limited impact on trade and the full costs of the aid flows will ultimately be borne by the taxpayer in the donor countries. However, we will demonstrate below that well-directed aid will entail little or no costs to the taxpayer, and is even expected to benefit taxpayers in the donor countries.

Figure 8 Rise in income tax rate needed to finance debt (percentage points)_



Source: NiGEM simulations

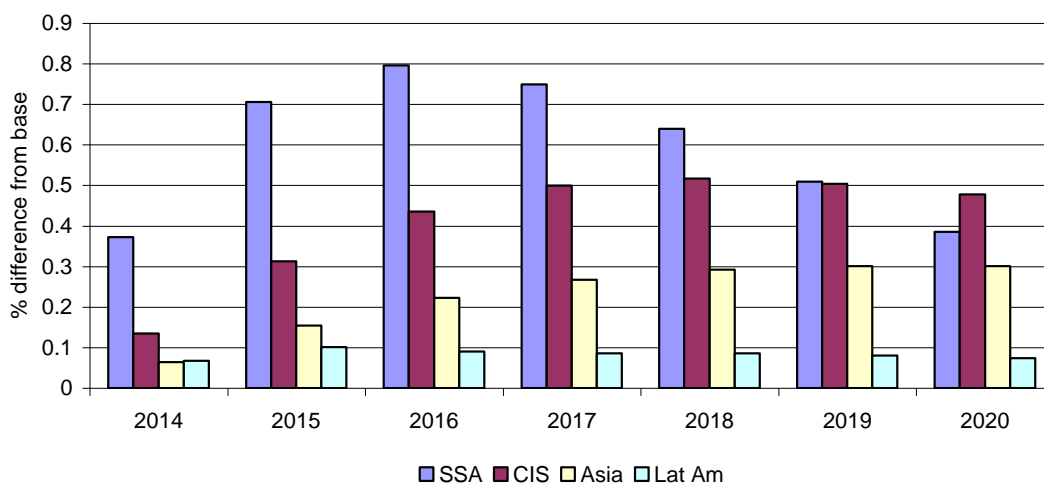
The figures indicate that the income tax rate would need to rise by between 2/100^{ths} to 5/100^{ths} of a percentage point in order to repay the debt. These negligible effects will dissipate after allowing for the expected rise in external demand that we explore below. However, this simulation does not include the effects of aid spending e.g. on trade costs or productive capacity.

Impact of a rise in spending funded through aid

Building on the previous scenario, we next allow for the fact that once the aid is received, it will be spent on goods and services in the recipient country. Initially, we assume that all the funds are spent on current consumption, through the support e.g. of social safety nets. The expected impact on the level of GDP in the recipient countries is illustrated in figure 9. When the aid is directed towards current consumption, GDP rises initially, but with no change in the capacity of the economy, the rise in demand will eventually start to put pressure on inflation, slowing demand to bring it back in line with the supply capacity⁸. The speed of this adjustment depends on the sensitivity of inflation in the economy to capacity pressures. The Sub-Saharan Africa region appears to be more sensitive to capacity pressures, and we could expect the positive impact on GDP to fully dissipate by 2024. As we show in the next section, if some of the aid is directed towards investment rather than consumption, we would instead expect to see a permanent positive effect on the level of output in Sub-Saharan Africa. The other regions tend to adjust more gradually, and the positive effects on GDP may be more persistent. The magnitudes of the effects are greatest in Sub-Saharan Africa, followed by the CIS. This is predominantly a reflection of the size of the aid flow relative to the economic size of the region. It suggests that with EU aid spread evenly over time, it raises GDP by between 0.1 and 0.7 per cent after two years (Figure 9). The biggest effects are expected in Sub-Saharan Africa, where the level of GDP is expected to rise by roughly €9.8 billion in purchasing power parity terms after two years.

⁸ This assumes that the economy is operating close to its full capacity, whereas if it is operating below capacity, the inflationary pressures would be less likely to emerge, allowing a more persistent impact on output.

Figure 9 Impact of aid spent on current consumption on GDP in recipients



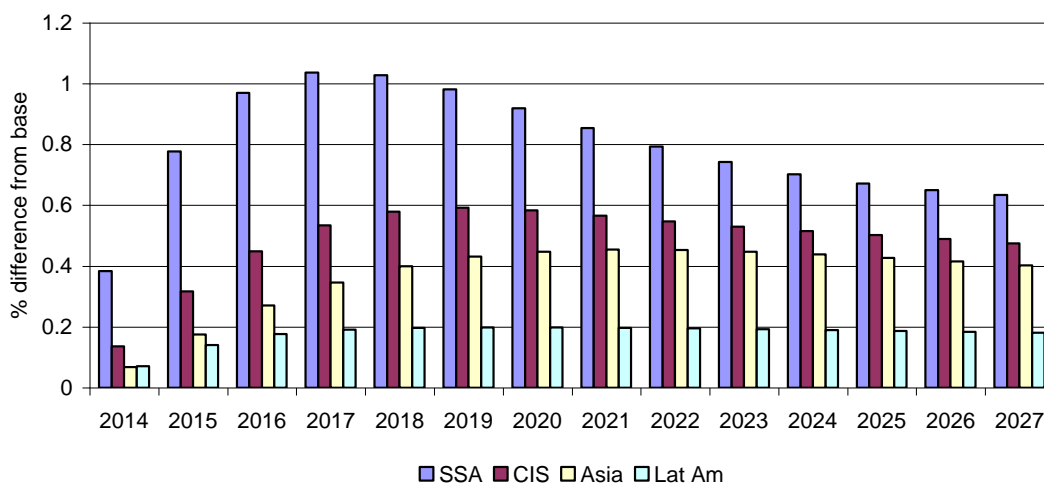
Source: NiGEM simulations.

Note: Figure illustrates the expected impact on the level of GDP, accumulating the effects of aid flows over time.

Directing spending towards infrastructure investment

As the next stage in building our scenario, we designate 60 per cent of the aid flows to be directed towards economic and social infrastructure investment in the recipient regions, while the remaining 40 per cent is directed towards current consumption. As we discussed in the previous section, investment in infrastructure can affect the productive capacity of the economy through two channels: a direct effect through the increase in the stock of infrastructure capital in the economy, and an indirect effect through productivity spillovers to the rest of the economy, as an improved infrastructure allows trade in all goods and services to be conducted more rapidly and efficiently. We assume a 20 per cent rate of return on the investment in infrastructure (see section 2.2).

Figure 10 Impact on GDP, of aid with 60% directed towards infrastructure



When we allow for aid to be directed towards infrastructure investment, the level of GDP remains permanently above base in all regions. The biggest impact is in Sub-Saharan Africa, where the magnitude of aid flows is highest.

Allowing for trade facilitation

The final step to constructing our scenario is to allow for an impact in trade prices, as the infrastructure investment can be expected to facilitate trade, making it less costly to import from and export to the aid recipients. Table 3 illustrates our estimate of the long-run impact on export prices and import prices in each of the countries and regions in the scenario. This includes the endogenous feedback of the decline in global prices overall through the export price system, as export prices are determined partly by domestic production costs and partly by world prices. These effects feed in gradually over time. Import prices are calculated as a weighted average of export prices in the other countries and regions on the model, to ensure that export and import prices are globally consistent.

Table 3 Expected long-run impact of aid flows on export and import prices
% difference from baseline

	Import prices	Export prices
SSA	-0.81	-5.99
D. Asia	-0.50	-0.88
CIS	-0.58	-2.29
Lat Am	-0.71	-1.61
Belgium	-0.35	-0.54
Czech Rep	-0.37	-0.41
Denmark	-0.38	-0.53
Finland	-0.31	-0.56
France	-0.38	-0.49
Germany	-0.37	-0.50
Greece	-0.34	-0.56
Hungary	-0.38	-0.57
Ireland	-0.34	-0.52
Italy	-0.37	-0.59
Neths	-0.36	-0.52
Austria	-0.37	-0.57
Poland	-0.40	-0.55
Portugal	-0.43	-0.86
Sweden	-0.35	-0.53
Spain	-0.39	-0.58
UK	-0.50	-0.42

Note: This reflects the expected long-run cumulative impact on export prices in each region, with the effects feeding in gradually over time.

Both export and import prices in all the EU donor countries can be expected to fall by between 0.3-0.9 per cent. The biggest effects would be expected in Portugal, given the economy's large trade share with the aid recipient regions. The decline in trade costs acts as a stimulus to global trade, and we see exports rising across the world as a result of the aid flows. Figure 11 illustrates the expected long-run effects on exports in

the EU and the world as a whole. By 2020, the value of world trade would be expected to rise by €120 billion as a result of the aid flows.

Figure 11 Expected long-run impact of aid flows on export volumes

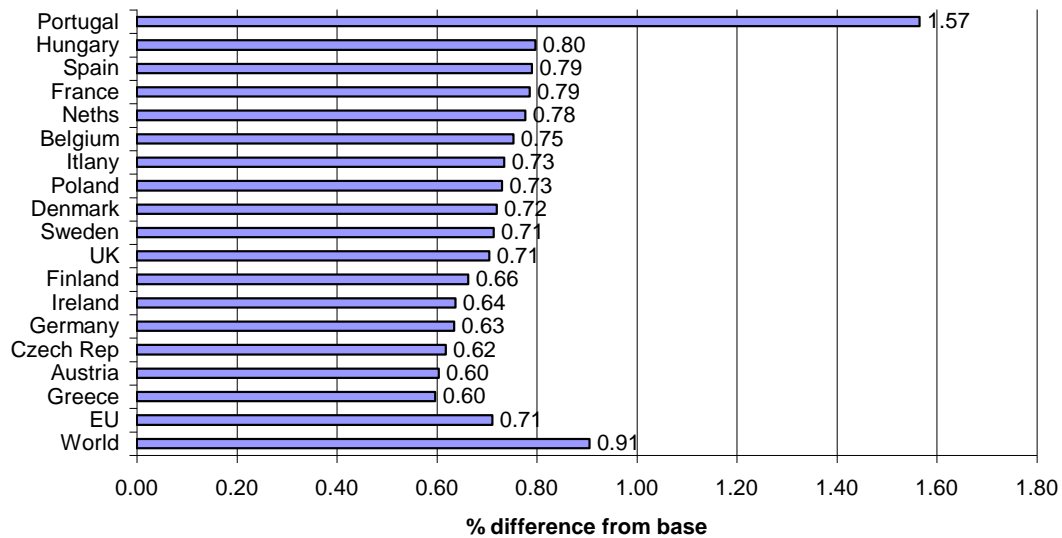
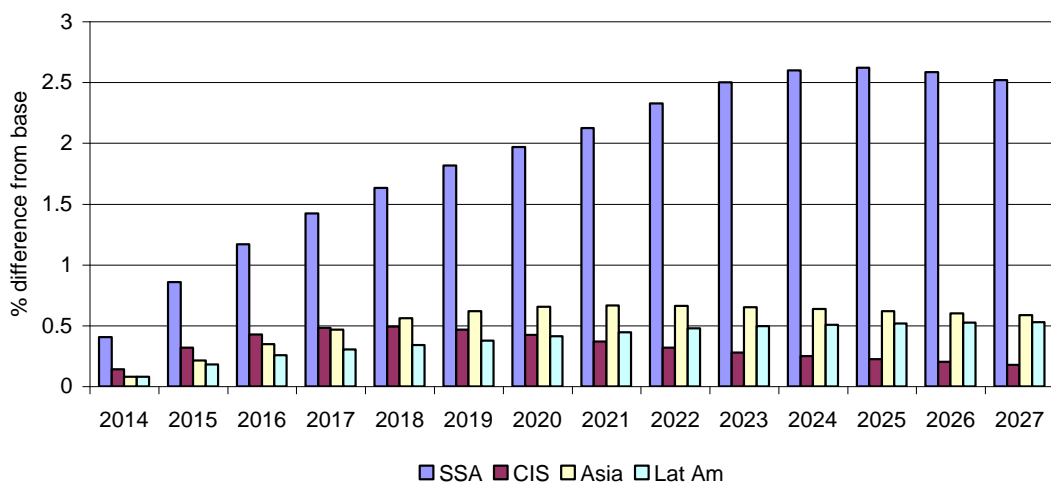


Figure 12 illustrates the expected impact of the aid flows on GDP in the recipient regions. The impact on Sub-Saharan Africa is expected to be significantly greater than the other regions, as the magnitude of the flows is higher relative to both the size of the economy and relative to the level of total exports from the region. After 10 years, we would expect the level of output in Sub-Saharan Africa to be 2½ per cent higher than it would be without the aid – or more than €55 billion by 2024. Output in the other regions would be expected to rise by ¼ - ¾ per cent after 10 years. At the global level, output is expected to be 0.2 per cent higher by 2020 as a result of the programme, reflecting the cumulative effects in both recipient and donor countries, as well as the rest of the world. The impact that this would be expected to have on global employment depends on the global income elasticity of employment, the degree of concurrent productivity gains and the response of real wages to declines in unemployment, but would be expected to lie in the range of 600,000-3,000,000 jobs worldwide.

Figure 12 Expected impact of aid flows on GDP in recipient regions



In the donor countries, we would also expect output to be higher as a result of the aid flows. Figure 13 illustrates the expected impact on the level of output in each of the donor countries at the end of the seven-year period. While the effects are small, the gains from the rise in trade and decline in trade costs are expected to outweigh the losses due to the deterioration of current account balances and rise in tax needed to finance the aid. At the EU-wide level, we expect the level of output to be 0.09 per cent higher by 2020 as a result of the aid programme, or €11.5 billion. Within the EU, the biggest impacts on GDP are expected to materialise in Portugal and Hungary, with smaller impacts expected in the UK and Germany. The total aid flows from the EU of €51 billion amount to approximately 0.4 per cent of the projected level of EU GDP for 2013. These costs are more than compensated for by the expected gains in trade and cost reductions, with more than a 20 per cent return on the investment.

Figure 13 Expected impact on GDP in donor countries and world, 2020

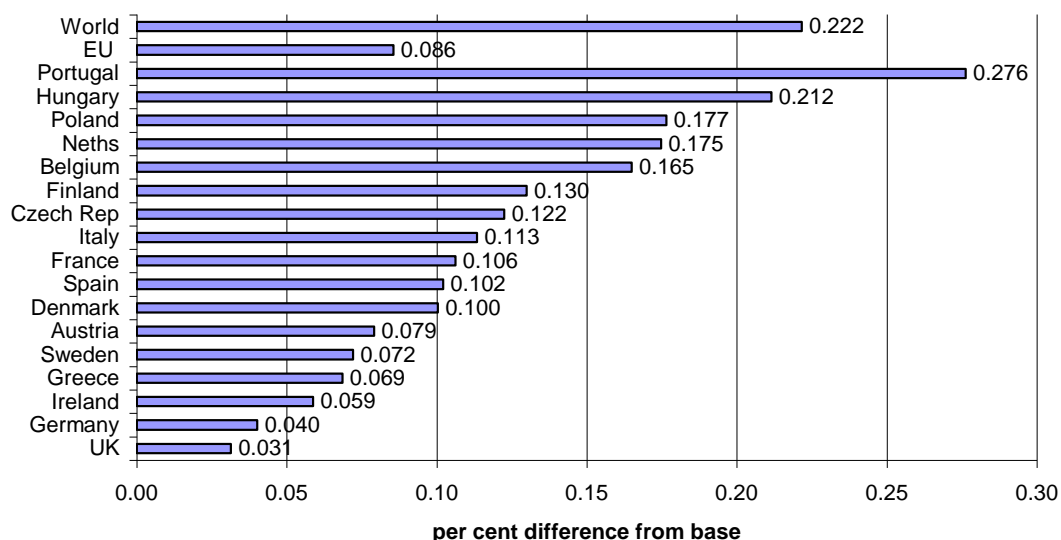
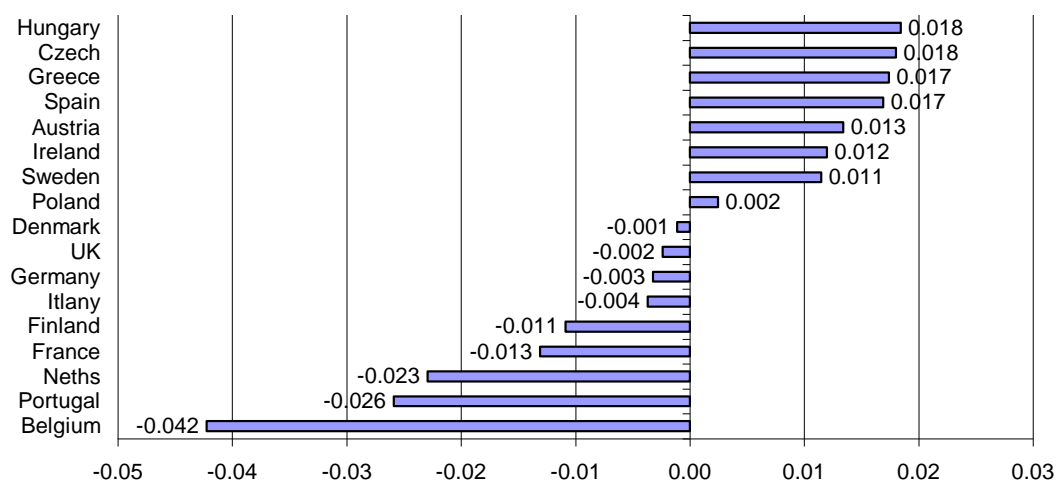


Figure 14 illustrates the expected impact on the income tax rate in each country as a result of the policy. The effects differ markedly from those illustrated in the first scenario above, as the anticipated rise in GDP supports public finances, and in more than half of the countries we would expect tax rates to actually decline as a result of the aid flows, despite the initial rise in government debt required to finance the aid. In the remaining countries, the expected rise in income tax rates is negligible, with a maximum increase of 18/1000's of a percentage point needed in Hungary and the Czech Republic. If the average income is €25,000 per annum, this would imply a rise in the average tax burden of just €4.5 per annum. Over the 7 years of the investment even these costs are offset by the rise in trade and reductions in consumer prices, and the investment made in the €51bn in development aid is completely recouped by EU taxpayers.

Figure 14 Expected impact on income tax rates in donor countries, 2020 (percentage points)



4 Conclusions

This paper examined the quantitative effects of EU aid (specifically the European Development Fund and the Development Cooperation Instrument totalling €51 billion over 2014-2020). This is the first study that quantifies the potential effects of proposed EU aid on both sending and receiving countries. We reviewed the literature on EU aid and the effects of aid generally, used this to derive possible effects of EU aid which are subsequently modelled in a commonly used general equilibrium model.

If managed well, EU aid can lead to faster growth in receiving countries which will lead to faster growth in imports including from the EU. This paper shows that under certain plausible assumptions, EU aid is an investment that can lead to positive net effects on growth in the EU. We estimate a 20 per cent return on the investment in developing countries if aid is channelled effectively. By 2020, this €51bn aid investment will lead to an almost 0.1 per cent boost in European GDP, a 0.2 per cent boost to global GDP and global gains in employment which are expected to fall within the range of 600,000-3,000,000. The net cost to the EU citizen of this investment would be zero, and the boost in growth will mean a positive net gain for the EU, as well as for the recipient countries.

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Appendix A: Regional composition and details of model for Sub-Saharan Africa in NiGEM

The regions that we refer to as Sub-Saharan Africa, Developing Asia, Commonwealth of Independent States and Latin America and Caribbean throughout the modelling section of this paper are composed of the following country groupings:

Sub-Saharan Africa

This group is based on the IMF's group Sub-Saharan Africa. From this we exclude the countries modelled individually on NiGEM (South Africa). This group includes:

Angola	Eritrea	Namibia
Benin	Ethiopia	Niger
Botswana	Gabon	Nigeria
Burkina Faso	Gambia, The	Rwanda
Burundi	Ghana	São Tomé and Príncipe
Cameroon	Guinea	Senegal
Cape Verde	Guinea-Bissau	Seychelles
Central African Republic	Kenya	Sierra Leone
Chad	Lesotho	
Comoros	Liberia	Swaziland
Congo, Dem. Rep. of	Madagascar	Tanzania
Congo, Rep. of	Malawi	Togo
Côte d'Ivoire	Mali	
Equatorial Guinea		Uganda
	Mauritius	Zambia
		Zimbabwe
	Mozambique, Rep. of	

Developing Asia

This region is based on the IMF's group Developing Asia. From this we exclude the countries modelled individually on NiGEM (China and India), and we add the advanced Asian economies that are not modelled separately on NiGEM (Singapore). This group includes:

Republic of Afghanistan	Democratic Republic	Singapore
Bangladesh	Malaysia	Solomon Islands
Bhutan	Maldives	Sri Lanka
Brunei Darussalam	Myanmar	Thailand
Cambodia	Nepal	Democratic Republic of
Fiji	Pakistan	Timor-Leste
Indonesia	Papua New Guinea	Tonga
Kiribati	Philippines	Vanuatu
Lao People's	Samoa	Vietnam

Commonwealth of Independent States

This region is based on the IMF's group Commonwealth of Independent States. From this we exclude the countries modelled individually on NiGEM (Russia). Georgia and Mongolia, which are not members of the Commonwealth of Independent States, are included in this group by the IMF for reasons of geography and similarities in economic structure. This group includes:

Armenia	Kazakhstan	Tajikistan
Azerbaijan	Kyrgyz Republic	Turkmenistan
Belarus	Moldova	Ukraine
Georgia	Mongolia	Uzbekistan

Latin America and Caribbean

This region is based on the IMF's group Western Hemisphere. From this we exclude the countries modelled individually on NiGEM (Brazil and Mexico). This group includes:

Antigua and Barbuda	Dominican Republic	Paraguay
Argentina	Ecuador	Peru
The Bahamas	El Salvador	St. Kitts and Nevis
Barbados	Grenada	St. Lucia
Belize	Guatemala	St. Vincent and the Grenadines
Bolivia	Guyana	Suriname
Chile	Haiti	Trinidad
Colombia	Honduras	Tobago
Costa Rica	Jamaica	Uruguay
Dominica	Nicaragua	Venezuela
	Panama	

The key equations for the models of Sub-Saharan Africa are described below. The other regional groups have models based on the same basic structure, although the parameters are region specific.

AFCBV Current balance, US\$ Mn

$$\#i \text{ afcbv} = \text{afbpt} + \text{afxval} - \text{afmval} + \text{afipdc} - \text{afipdd}$$

where afbpt are balance of payment transfers, afxval is African exports in US\$, afmval is African imports in US\$, afipdc is interest payments received by Africa, afipdd is interest payments paid by Africa.

AFPXCOM Price of commodity exports, US\$, 2000=100

$$\# \text{ afpxcom} = 0.04873 * \text{wdpmm} + 0.251114 * \text{wdpanf} +$$

$$\# 0.042418 * \text{wdpfdv} + 0.32965 * \text{wdpfld}$$

$$\# + 0.328086 * \text{wdpo}$$

where wdpmm is the price of metals and minerals, wdpanf is the price of agricultural non-foods, wdpfdv is the price of food, wdpfld is the price of beverages and wdpo is the price of oil.

AFPXNCOM Price of non-commodity exports, US\$, 2000=100

$$\# \log(\text{afpxncom}) = \log(\text{afpxncom}(-1)) + 0.136269$$

$$\# - 0.173991 * (\log(\text{afpxncom}(-1)) - 0.442582 * \log(\text{afcpix}(-1)))$$

$$\# - (1 - 0.442582) * \log(\text{afcedd}(-1))$$

$$\# + 0.105890 * \log(\text{afpxncom}(-1) / \text{afpxncom}(-2))$$

$$\# + (1 - 0.105890) * \log(\text{afcpix}(-1) / \text{afcpix}(-2))$$

where afcpix is competitor's export prices, afcedd is domestic prices in US\$ terms.

AFPX Deflator, exports of goods and serv, US\$, 2000=100

$$\#i \text{ afpx} = 0.27694 * \text{afpxcom} + (1 - 0.27694) * \text{afpxncom}$$

AFDD Domestic demand, US\$ Bn, 2000 prices

$$\# \log(\text{afdd}) = \log(\text{afdd}(-1))$$

$$\# + 0.451 - 0.132189 * (\log(\text{afdd}(-1)))$$

$$\# - 0.60 * \log(\text{afxvold}(-1))$$

$$\# + 0.0059783 * \text{afnar}(-1)$$

$$\# + 0.5 * \log(\text{afpopt} / \text{afpopt}(-1))$$

where afxvold is African export volumes in terms of domestic consumer prices, afnar is net foreign debt as a share of GDP, and afpopt is total population.

AFMVOL Imports of goods and servs, Bn US\$, 2000 prices

$$\# \log(\text{afmvol}) = \log(\text{afmvol}(-1)) - 0.284631$$

$$\# - 0.092493 * (\log(\text{afmvol}(-1)) + 0.68077 * \log(\text{afrpm}(-1)))$$

- 1.24*log([afdd](#)(-1)+[afxvol](#)(-1)))
 # + 1.1*log(([afdd](#)+[afxvol](#))/([afdd](#)(-1)+[afxvol](#)(-1)))
 # -0.06147*log([afrpm](#)/[afrpm](#)(-1))

where afrpm is import prices relative to domestic prices.

AFXVOL Exports of goods and servs, Bn US\$, 2000 prices

log(afxvol) = log([afxvol](#)(-1)) +0.11185
 # -0.172654*(log([afxvol](#)(-1)) +1.350605*log([afrpx](#)(-1))
 # -1.0*log([afs](#)(-1)))
 # +1.08*log([afs](#)/[afs](#)(-1)) -0.268*log(([afrpx](#))/([afrpx](#)(-1)))

where afrpx is African export prices relative to competitor's, afs is external demand.

AFY GDP, US\$ Bn, 2000 PPP

#i **afy** = [afdd](#) + [afxvol](#) - [afmvol](#)

AFCED Consumer expenditure deflator, 2000=100

log(afced)= log([afced](#)(-1))+ 0.001774
 # -0.02545*(log([afced](#)(-1))-log([afpmd](#)(-1))-1.490*[afog](#)(-1))
 # + 0.201981*log([afpmd](#)/[afpmd](#)(-1))
 # + 0.106133*log([afpmd](#)(-1)/[afpmd](#)(-2))
 # + (1.-0.201981-0.106133)*log([afinf](#))
 # +0.22897*([afog](#)-[afog](#)(-1))

where afpmd is import prices in domestic currency, afog is the output gap (afy/afycap), afinf is inflation expectations.

AFYCAP Trend output for capacity utilisation

log(afycap) = log([afycap](#)(-1)) - 1.566 - 0.2*(log([afycap](#)(-1)) - [aftechl](#)
 # - log([afpopt](#)(-1)))

where aftechl is the level of technical progress and afpopt is total population.