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The effects of aid on EU employment and trade

An econometric investigation

Max Mendez-Parra and Dirk Willem te Velde

Key messages

- For every $1 the European Commission spends on aid, European Union exports increase by between $1.02 and $3.69.
- Aid provided by EU Member States increases each Member State's exports by, on average, between $0.19 and $2.29 for every $1 spent.
- The current level of aid the EU provides generates over 140,000 jobs in the EU, often among low- and middle-skilled workers.
- Business services, basic and fabricated metals and the agriculture, fishing and forestry sectors are the most important aid-related employment-generating sectors.

Overseas Development Institute
203 Blackfriars Road
London SE1 8NJ

Tel. +44 (0) 20 7922 0300
Fax. +44 (0) 20 7922 0399
E-mail: info@odi.org.uk

www.odi.org
www.odi.org/facebook
www.odi.org/twitter

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Acronyms

AfT	Aid for Trade
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CGE	computable general equilibrium
DCI	Development Cooperation Instrument
DFI	Development Finance Institution
EC	European Commission
ECU	European Currency Unit
EDF	European Development Fund
ENI	European Neighbourhood Instrument
EPA	Economic Partnership Agreement
EU	European Union
FE	fixed effects
FTA	free trade agreement
GDP	gross domestic product
GMM	generalised method of moments
GTAP	Global Trade Analysis Project
IO	input-output
IPA	Instrument for Pre-Accession Assistance
MFN	most favoured nation
MRIO	Multi-Region Input-Output
MS	member state
NiGEM	National Institute Global Econometric Model
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OLS	ordinary least square
RE	random effects
TRAINS	Trade Analysis Information System
UK	United Kingdom
UN	United Nations
UNCTAD	UN Conference on Trade and Development
WDI	World Development Indicators
WIOD	World Input Output Database
WTO	World Trade Organization

Executive summary

This report explores the effects of aid provided by the European Commission (EC) and the European Union (EU) Member States (MSs) on EU exports and on employment generation in the EU MSs, at the sectoral and aggregated level. We find that:

- exports constitute the primary and the most direct channel through which aid affects the economy of the EU
- the effects of exports are transmitted to the domestic EU economies via effects on output and employment
- the EU has high levels of economic integration and value chain activity, which the analysis needs to take into account
- through value chains, EC aid-generated exports in one MS will affect output and employment in the rest of the MSs
- aid provided by each of the EU MSs will operate through the same channels of transmission in the rest of the MS.

There are significant effects of EC aid on EU exports:

- There is a positive and significant relationship between EC aid and EU exports.
- Depending on the estimation method, exports to EC aid elasticity falls between 0.007 and 0.024.
- This implies that, for every $1 the EC spends on aid, there is an increase in exports of between $1.02 and $3.69, depending on the estimation method.
- Consequently, the annual value of aid the EC provides generates between $17 billion and $51 billion worth of exports.
- Aid provided by the EU supplements aid provided by EU MSs.
- On average, aid provided by EU MSs increases each MS's exports by between $0.19 and $2.29 for every $1 spent, depending on the estimation method.

We use the estimated elasticities and the actual levels of aid the EC and the EU MSs provide to obtain an estimate of the level of exports. This allows us, using a multi-regional input-output table, to calculate the effects of employment in the EU MSs:

- The current annual average level of aid the EC provides generates, assuming a very conservative estimation, around 141,000 jobs in the EU.
- This represents approximately 0.06% of total EU employment.
- Of these jobs, 80% are generated among low- and middle-skilled workers.
- Machinery rental, along with other business activities, is the most affected sector in terms of employment creation.
- The impact on this sector reflects the importance of the value chain dimension in terms of the effects of aid on the EU economy.
- Other affected sectors in terms of employment creation are basic metals and fabricated metals and agriculture, hunting, fishing and forestry.
- France, Germany and Italy show the highest effects in terms of employment creation.
- In terms of low-skilled workers, Italy, Romania and Spain present the largest effects.
- Relative to their workforce, the Czech Republic and Slovenia present the largest total employment effects.
- The largest relative employment effects of the aid the EU MSs provide are seen in Estonia and Romania.
- The above is mainly explained by the effect of other MSs' aid through the existence of production networks with these countries.
- Germany, Romania and the UK present the largest absolute employment effects of the aid provided by MSs.

1. Introduction

Aid is a substantial part of development finance in the poorest countries. Productivity- and trade-enhancing aid has helped recipient countries expand their trade and production. In addition to its effects on the recipient country, aid affects the economies of donor countries. Aid needs to be financed at home, which initially leads to a reduction in disposable income in the donor country. However, at the same time, aid affects the real economy of donor countries. So far, there has been less analysis on these effects; this report examines them using econometric techniques.

We postulate that aid can increase exports from the donor country to the recipient country. Given that much aid is untied, the effect of aid on exports could work through other channels, such as the goodwill of recipients towards exporters from donor countries or technological dependency on the donor country. Regardless of the reasons, we find evidence that suggests the existence of a relationship between aid provided by the European Commission (EC) and exports to recipient countries

Although exportation constitutes the main direct channel through which aid affects the economies of donor countries, it is not the only one. Aid-generated exports are expected to trigger a series of effects in the domestic economies of donor countries. Higher exports will increase output, value added and employment in donor countries. Increased output will increase demand for both domestic and imported intermediate goods. The organisation of production in regional and global value chains helps extend the effects of the aid donors provide to third countries. Aid-generated exports require imported intermediates that expand employment and output in other countries.

This is particularly relevant in the context of the European Union (EU). Given the high degree of economic integration that exists between its Member States (MSs), any analysis of the effects aid has on the EU economy needs to take these production relationships into account. Exports generated by EC aid in one MS will affect production and employment in many MSs.

The purpose of this report is to quantify the effect of the aid the EC provides on exports and employment in the EU, including through the main programmes, such as the European Development Fund (EDF), the Development Cooperation Instrument (DCI), the Instrument for Pre-Accession Assistance (IPA) and the European Neighbourhood Instrument (ENI). Although individual donors have provided some evidence of the effect of this aid on their exports, the evidence is scarcer in the context of aid provided by the EC. So far, no studies have addressed the effect of EC aid on employment in the EU's productive sectors and/or considered the employment skills level of the workforce.

We also evaluate the effect of the aid from each MS on its own exports and employment as well as on other countries. This helps us understand the complementarity that exists between the two types of aid in the generation of economy-wide effects in the EU. Both sources of aid help increase EU exports and jobs for workers with different levels of skill. As we have already said, the effects are not limited to the sectors that expand their exports as a result of the aid, but spill over to other sectors in domestic economies as well as in the economies of the other EU MSs.

This report is organised as follows. Section 2 discusses the existing evidence on the effects of aid on donor economies. This section helps outline the main channels through which aid affects exports – the main and primary transmission channel of aid to the real economy in donor countries. Section 3 presents the methodology and the data we use in this report. It also provides additional discussion about the nature of the effects of aid on donor economies. Section 4 presents the econometric analysis and discusses its results in terms of the effects of aid on exports. We contrast these results with previous findings in the literature. In Section 5 we perform an analysis of the effects on employment and discuss its results. We present these results at both the aggregate level and the sectoral and country level. Section 6 concludes.

2. Aid effects on donor countries

The effects of development assistance on recipient countries have been extensively documented. If we assume a simple transfer from donor to recipient country, aid generates an increase in income in the recipient country. If this aid is spent on consumption, it can lead to inflation and the Dutch Disease phenomenon (Rajan and Subramanian, 2011). However, if aid is spent on investment and is used to increase the productive capabilities of the recipient country, these effects can be reduced. Aid for trade (AfT), on the other hand, has important effects on trade costs that increase the competitiveness of the recipient country. Aid consequently leads to an increase in exports from the recipient country.

Barrell et al. (2013) and Holland and te Velde (2012) have reviewed a large body of literature. The overall results, however, tend to be mixed. Nevertheless, using recent evidence, Tarp (2012) suggests that sustaining development assistance at certain levels can enhance living standards in recipient countries. At the same time, Massa et al. (2016) suggest that other types of development assistance, such as investments by development finance institutions (DFIs), present complementary effects to aid, particularly in lower- to middle-income countries.

The effects of development assistance on donor countries have received substantially less attention. In this section, we describe the main channels through which aid affects the economies of the donor country. Moreover, we present some empirical evidence that will help us understand and compare the results we obtain in this report.

One of the earliest studies attempting to assess the effect of aid on donor country's exports (Nilsson, 1997) indicates that a 1% increase in EC aid would increase EU exports by 0.23% – or, for every $1 given in aid, exports would grow by $2.6. This study constitutes the earliest attempt to use the gravity model in this context. Wagner (2003) finds that the elasticity of exports to aid of 20 donors between 1970 and 1990 was between 0.062 and 0.195. This means, on average, an increase in exports of the country giving aid of between $0.73 and $2.29 for each $1 given in aid. Wagner finds an elasticity of 0.33 in exports between 1970 and 1992 for multiple donors and recipients.

Massa and te Velde (2009) try to identify differences in the effects of different types of aid in the exports of donors and recipients. They find that, although loans and grants increase exports, grants tend to have a higher distortionary effect. They find that a 1% increase in aid given between 1980 and 2006 from a series of 15 donors corresponds to an increase in exports of 0.017% on average.

Silva and Nelson (2012), using a panel from 1962 to 2000 and considering all donors and recipients, find an elasticity of 0.024. They attribute the low elasticity to the fact that the positive effect of aid on exports is offset by changes in relative prices.

Other studies focus exclusively on the aid provided by single countries. Martínez-Zarzoso et al. (2008) look at the effects on German exporters generated by German aid. They find an elasticity of between 0.08 and 0.13, which translates into increases in exports of between $1 and $1.5 for each $1 given in aid by Germany. Martínez-Zarzoso et al. (2013a) apply a similar method (gravity modelling) to assess the effect of Dutch aid on Dutch exports. They find an elasticity of 0.034 estimated for the period 1973–1999, which translates into an increase of exports of $0.29 for each $1 given in aid.

In an analysis of the effect of Germany's aid on German exports during the period 1962–2005, Nowak-Lhemann et al. (2009) find an elasticity of 0.09. In the long term, this translates into an increase in exports of $1.04 for every $1 spent on aid. In the short term, the effect translates into $0.69 for every $1 given in aid. The use of this type of co-integration technique allows the authors to investigate the causal relationship. While aid seems to be weakly exogenous, the data rejects the null of weak exogeneity of exports. Consequently, exports are caused 'in the Granger sense' (Granger, 1969) by aid. This implies a unidirectional relationship between aid and exports in this case. Similar findings are highlighted by Arvin et al. (2000), suggesting that untied aid provided by Germany caused exports à la Granger.

Lloyd et al. (2010) further explore the causality link. The authors investigate co-integration and causality between the aid of France, Germany, the Netherlands and the UK and exports to different recipients. They find a clear statistical link between aid and trade flows; however, the evidence in favour of direction from aid to trade is as strong as the opposite, suggesting that, for some donors, the current level of exports is a determination of the allocation of its aid. Martínez-Zarzoso et al. (2013b) also

run the Granger causality test and find a bidirectional causality between German aid and German exports.

As we have seen, the relationship between donor exports and aid is positive. In some cases, it has been possible to identify causality between aid and donor exports. In practice, exports constitute the main and most direct channel through which aid affects the economy of donors. This can partially be explained by the fact that, in most of the period analysed in these studies (and in fact in our study), a considerable share of aid is tied to exports from the donor country. Until the 1990s, around 50% of donor development aid was tied to exports (Martínez-Zarzoso et al., 2008).

However, Arvin and Baum (1997), Arvin and Choudhry (1997) and Arvin et al. (2000) find that aid without tying generates the same export-promoting effects as tied aid. They suggest other channels may explain the higher exports from donor countries. They include in these a sense of 'goodwill' towards donor exporters or the existence of trade concessions towards donors' exports. Moreover, aid may be seen as an export-promoting activity similar in effect to, for example, the presence of of an embassy or consulate in the recipient country and the celebration of trade missions (Moons and van Bergeijk, 2011).

In addition, Djajic et al. (2004) suggest aid may alter recipient preferences and technology, creating a permanent link with the exports of donors. For example, previous infrastructure projects financed by aid may create a permanent requirement for inputs produced by the donor. Consequently, over time, the recipient country becomes 'dependent' on the exports from the donor.

At the same time, aid may imply a transfer that increases disposable income in the recipient country. Particularly when aid takes the form of general budget support to governments, this generates a demand effect that benefits domestic producers and foreign producers. However, the income effect tends to be reduced by the action of aid-related administrative costs (Easterly and Williamson, 2010) and bad governance (Kaufmann, 2009).

Nevertheless, this income effect will not, beyond the reasons explained above, generate a particular increase in demand to the donor. It will increase exports from trade partners in line with the recipient's preferences. This suggests that aid provided by one donor will benefit other exporters as well. The effect of other donors' aid on exports is reviewed later in this report.

The effects of aid on the donor economy are transmitted to the rest of the economy. However, the effect on exports constitutes the primary link between aid and the domestic donor economy. Other studies focus on other dimensions of the effects of aid in the donor economy. However, given the indirect channels under operation, these use other types of analytical tools, such as modelling.

Holland and te Velde (2012) use the National Institute Global Econometric Model (NiGEM) to simulate the effect of aid provided by the EC on EU exports. For example, €51 billion of aid provided over the period 2014–2020 would generate an increase in EU gross domestic product (GDP) of 0.1% every year. In addition, EU exports would increase by on average 0.71% each year.

Carreras et al. (2016) use the same model with an updated database to analyse the effects of EU aid. However, they find the €77 billion (including the EDF, the DCI, the IPA and the ENI) would generate an 0.1% increase in exports and an almost imperceptible increase in GDP. This result changes slightly when it is assumed that blending of financial instruments provides additional financial leverage.

Fic et al. (2014) use NiGEM to assess the effects of Dutch aid on the Dutch economy. They find that Dutch GDP would increase annually by 0.03% as a result of the aid, implying a rate of return of the order of 4%. Moreover, exports would increase by on average 0.5%.

The effects on a donor's domestic economy go beyond the effects on exports or GDP. Employment and household incomes in the donor country are affected. Increased GDP will increase demand for labour in the donor country. In a context of full employment, it is expected to lead to an increase in wages and, consequently, household incomes. In a context of unemployment, it is expected to increase the number of people employed.

The modelling exercises study these general effects on employment. Holland and te Velde (2012) and Carreras et al. (2016) assess the effect of EU aid on employment. However, given the nature of the model, the results on employment are very limited. They cannot disaggregate effects by sector or other type of labour, such as the level of skill of the employment created. Moreover, the nature of the model and the exercise means employment remains very close in numbers to what it is in the baseline. Although in the short term there may be some gains in terms of employment, the model fails to show any significant long-term effect (with the effects falling mainly on wages instead).

In principle, another possible methodology to assess the effects of aid on employment entails Computable General Equilibrium (CGE) models. The effects of aid on employment and trade have been analysed primarily in the context of recipient countries. Using the Global Trade Analysis Project (GTAP) database, Pycroft (2008) analyses the effects of AfT on employment and trade in Ethiopia.

These issues are addressed by Martínez-Zarzoso et al. (2013a, 2013b), who use input-output (IO) tables to compute the effect of aid-generated exports on employment. After estimating the effect of aid on exports, the authors use the Leontief (1936) model to calculate the employment generated in each sector. Moreover, they consider the effects of the intermediate demand for inputs that exports generate. Consequently, they provide the complete demand effect of employment assuming a fixed technology.

IO tables can be used to assess the effect of aid on output and on value added in each of the sectors. In the same way that they assess how aid affects employment via its effects on exports, IO tables can assess how much output from each of the sectors will be necessary for the required aid-related exports.

When the IO analysis is used in the context of single country analysis, the effects on output and employment will be limited to the economy under study. However, if a multi-region input-output (MRIO) analysis is available, we can measure the effects of aid transmitted to other countries. Consequently, exports generated by aid in one country affect output, value added and employment in other countries via demand for imported intermediates to produce exports. MRIOs are increasingly being used to analyse the value chain implications and production-sharing of trade (see Timmer et al., 2013; Wang et al., 2013). This is analysed later in this report.

3. Methodology and data

3.1. Methodology

The analysis combines an econometric analysis of the effects of EC aid on EU exports and of the effects on employment in the EU. The analysis of the effects of exports is performed independently and provides results on the sensitivity of exports to aid, according to the principles outlined in the previous section. Employment in the EU depends on the increase in final demand. The increase in exports generated as a result of aid will provide this push.

3.1.1. Econometric analysis: the effects on exports

We assess the effect of EC and EU MSs' aid on exports, using a gravity model of trade (Tinbergen, 1962). The gravity model has been used extensively to explain the relationship between structural, geographical and policy variables and bilateral trade flows. This model includes variables associated with the economic sizes of both exporters and importers, the distance between them, common languages, existence of free trade agreements (FTAs) and many other variables that can affect the trade between two countries.

The unexplained part of the variation of trade (i.e. the portion that cannot be explained by structural, policy or geographical variables) may contain relevant information about the bilateral trade. The objective is to try to find the relationship that exists between aid and this unexplained part. In this way, the effect of aid on exports is controlled for the other factors highlighted. Nevertheless, it is not only aid provided by the donor country that can affect exports. Aid provided by other countries will also affect its trade. Therefore, we include a decomposition of the aid the beneficiary country receives.

We use two equations. The first equation applies to an aggregate model that captures the trade of the EU as a whole with each of the recipient countries. The other equation applies to a disaggregated panel that models the trade of each of the EU MSs with each of the recipients. The first equation can be written as:

$$\ln(Xus_{jt}) = \alpha + \beta_1 \ln(gdprec_{jt}) + \beta_2 \ln(exr_{jt}) + \beta_3 \ln(tariff)_{jt} + \beta_4 \ln(dist_J) + \beta_5 \ln(odaeu_{jt}) + \beta_6 \ln(oda_{jt}) + \beta_7 \ln(odaotnoeu_{jt}) + \varepsilon_{jt} \quad (1)$$

Where Xus_{jt} represents the value of EU exports to each recipient j in time t, $gdprec_{jt}$ is the current GDP in country j at time t. This provides a measure of the size of the demand in the recipient country and is expected to be positively related to the exports. exr_{jt} is the exchange rate (local currency per $1) of the recipient country j at time t. Strong local currencies are expected to be associated with high value of exports (in local currency terms, imported products are cheaper). *tariff* presents the average tariff applied by country j at time t to imports. This represents the most favoured nation (MFN) tariffs, applied to all members of the World Trade Organization (WTO). In other applications, the existence of an FTA tends to be included. However, we anticipate that this variable will play a minimal role in the case of the EU. Although the EU grants preferences to exports from developing countries, there is no such reciprocal treatment for EU exports. The EU has engaged in FTAs with many recipient countries, particularly under its Economic Partnership Agreements (EPAs). However, these agreements (the oldest one having been signed in 2008) have not yet been fully implemented by the recipient countries (i.e. they have had long implementation periods). Therefore, it is expected that the effect will be null. Therefore, we consider that the MFN tariff is the appropriate measure of trade policy in the recipient country. $dist_J$ captures the average distance (measured in kilometres) between all the MSs and the recipient country j.

In terms of the aid variables, $odaeu_{jt}$ represents the official development assistance (ODA) effectively disbursed by the EC in the recipient country j. oda_{jt} provides the total ODA disbursed by the EU MSs to country j at time t. Finally, $odaotnoeu_{jt}$ captures the aid provided by all other donors to country j at time t. With respect to this, there is uncertainty about the direction of the relationship. On the one hand, aid provided by third countries leads to an increase in income in the recipient country. This should lead to a generalised increase in demand that, consequently, will increase demand for EU exports. On the other, if the aid is required to be spent on goods and services provided by firms resident in the donor country or if there is a goodwill effect that leads the recipient to import from the country that provided the aid, the effect on EU exports will be negative.

The equation for the EU MSs' exports is similar. However, it includes more variables as well as needing to consider the disaggregated nature of the data. It can be written as:

$$\ln(Xus_{jt}) = \alpha + \beta_1 \ln(gdprec_{jt}) + \beta_2 \ln(gdp_{don_{it}}) + \beta_3 \ln(exr_{ijt}) + \beta_4 \ln(tarriff)_{ijt} + \beta_5 \ln(dist_{ij}) + \beta_6\, col_{ij} + \beta_7\, lang_{ij} + \beta_8 \ln(odaeu_{jt}) + \beta_9 \ln(oda_{ijt}) + \beta_{10} \ln(odaoteu_{rjt}) + \beta_{11} \ln(odaotnoeu_{jt}) + \varepsilon_{jt} \quad (2)$$

The variables present in equation 1 have the same interpretation here. However, they include in some cases a sub-index *i*, representing the donor country. Therefore, Xus_{ijt} represents the exports of EU MS *i* to country *j* at time t.

There are other variables that play a role in the disaggregated model that are not present in the aggregated one. $gdpdon_{it}$ is the GDP of the EU MS. In the aggregated model, the effect associated with the size of the donor is captured by the introduction of time dummies, as the GDP of the EU is invariant across destinations. In the case of the disaggregated model, we need to control for the size of the donor EU MS. The relationship could imply a supply push (i.e. higher output is associated with higher exports) or a demand effect (i.e. higher income increases absorption and reduces exports).

col_{ij} and $lang_{ij}$ try to capture the presence of historical and cultural bounds between exporter and importer. The first assesses the existence of a colonial relationship between the exporter and importer. In the context of the EU, this is particularly relevant. The second variable identifies the existence of common official languages in the exporter and the importer. Consequently, it is expected that France, for example, will export comparatively more, all things being equal, to the countries that have French as an official language than to the rest.

Finally, $\ln(odaoteu_{rjt})$ captures the aid provided by other EU MSs. In the aggregate model, this type of aid along with the exporter aid were captured by oda_{jt}. However, in the disaggregated model, the sub-index *r* includes all the other EU MSs except country *i*.

We estimate equations 1 and 2 using different econometric approaches. Initially, we use a pooled ordinary least square (OLS). In order to take advantage of the cross-sectional and temporal dimensions, we use standard panel techniques such as fixed effects (FE) and random effects (RE) models. In addition, we try to address endogeneity by estimating a linear dynamic model, using the lag of the dependent variable as the explanatory variable. This will help address the issue of the time mismatch between the aid disbursed and actual purchases and imports.

The OLS techniques allow us to estimate the effect of the time-invariant variables (distance, common language, colonial past). However, when using FE or RE models, the effect of these variables cannot be computed. They are considered in either the FE or the RE. The advantage of this model, however, is that it tends to address issues associated with the efficiency and unbiasedness of their estimators. Consequently, it tends to be preferred during econometric estimations.

As we have mentioned, there is a high possibility of endogeneity. This implies that the relationship between aid and exports may be bidirectional. For example, aid may be allocated to countries with important trade links. We address endogeneity concerns by introducing lagged values of the dependent variable to a linear dynamic model. This model takes two forms. It may be a simple difference in difference model or the Generalised Method of Moments (GMM), originally developed by Arellano and Bond (1991) and further improved by Blundell and Bond (1998). In this framework, lagged values of the endogenous variable are used as instruments for the equation in differences and lagged differences are used for the instruments in the equations in levels.

Nevertheless, these dynamic estimation techniques have been designed to be used for short panels (i.e. panels with many cross-sectional observations but limited temporal dimension). In long panels, there is a chance of the presence of persistence of temporary shocks and cyclical effects. Consequently, to avoid this risk, it is advisable to estimate the equations using subsamples. Although this allows us to track the evolution of the effect of aid on exports over time, it does not make use of all the information available. Consequently, although the results can be informative, we do not base our analysis on these.

3.1.2. Input-output analysis: the effects on employment

The IO analysis uses a series of assumptions. Each sector in each country produces one product. There is no substitution between intermediate inputs. This means it is impossible to change the production technology to adjust to the market conditions. There are constant returns to scale (i.e. if we double all inputs we will obtain double output). Final demand is exogenous: increases in labour income, for example, will not affect demand for final products. There is an infinite supply of factors. This means increase in the demand of labour can be met. Finally, there are no stocks; if demand rises, output will need to be raised.

We calculate the employment effects of aid on employment by using IO analysis. This analysis is based on the Leontief (1936) equation:

$$y = (I - A)^{-1}x \quad (3)$$

Equation 3 identifies the amount of output *y* necessary to meet final demand *x*. The output must be enough to supply the demand sector as well as meet the intermediate demand necessary to produce the inputs required to supply that demand. This is captured by *A*, a matrix of technical coefficients. This matrix identifies how many units of each input are required to produce one unit of each product.

In our exercise, demand is given by the exports generated by aid. In a given year, for example, aid will

increase exports by Δx. Therefore, output in each of the sectors will increase by:

$$\Delta y = (I - A)^{-1}\Delta x$$

Vector Δx and Δy is formed by the exports and output of multiple sectors. In addition, in a world of international production structure, inputs may be sourced domestically or from abroad. Matrix A, therefore, contains technical coefficients for each product from each country. Therefore, vector Δy and Δx contains exports of each sector from each country in the world and the output of each sector in each country in the world. Consequently, an increase in the exports in a given sector in a country will increase the output of all the sectors in all countries through the provision of intermediate inputs.

The calculation of the effect on gross output allows us to calculate the effect on employment. Each sector in each country, in addition to using inputs from other sectors, uses labour to produce its outputs. Consequently, the effects of exports (and consequently of aid) on jobs are given by:

$$\Delta l = a_l \Delta y = a_l (I - A)^{-1}\Delta x \quad (4)$$

Where a_l gives the number of jobs necessary to produce one unit from a particular sector in a given country, Δl gives the number of jobs generated in each sector in each country.

3.1.3. Data

Disbursements of ODA are sourced from the Organisation for Economic Co-operation and Development (OECD) Development Financial Statistics.[1] The database contains annual disbursements by donor and recipient country. Donors include the EC, the EU MSs and other country donors. We exclude from the analysis aid provided through multilateral organisations and aid provided to regions. This is because we cannot identify with certainty the donor/beneficiary. Data cover the period 1989–2014. Aid flows are expressed in US dollars.

Trade data have been obtained from the EU ComExt database. We have extracted total exports from each of the MSs to each of the recipient countries. Data are expressed in euros/European currency units (ECUs) and converted to US dollars using EU data on exchange rates.

Control variables used in the regressions (donor and recipient current GDP and recipient country local currency/US dollar exchange rate) have been extracted from the World Bank World Development Indicators (WDI). Distance, common language and common colonial past indicators have been obtained from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) Geodist database (Mayer and Zignago, 2011). Tariff data for the recipient countries have been obtained from the UN Conference on Trade and Development (UNCTAD) Trade Analysis Information System (TRAINS) database. Table 1 presents a series of summary statistics used in the disaggregated and the aggregated models.

Table 1. Summary statistics of variables in disaggregated and aggregated models

	Disaggregated model					Aggregated model				
Variable	Obs	Mean	Std. dev.	Min	Max	Obs	Mean	Std. dev.	Min	Max
LXus	58,712	15.56	3.20	0.25	25.22	3,204	20.03	2.09	12.73	26.00
Loda	58,712	7.75	7.13	0.00	21.88	3,204	17.18	2.87	0.00	22.87
Lodaeu	58,712	10.44	7.93	0.00	20.48	3,204	14.34	4.51	0.00	20.44
Lodaoteu	58,712	10.41	9.21	0.00	22.88					
Lodaotnoeu	58,712	17.42	2.94	0.00	22.24	3,204	17.29	2.88	0.00	22.24
Lgdpdon	58,712	26.21	1.55	22.09	28.98					
Lgdprec	58,712	23.07	2.07	18.15	29.88	3,204	25.71	2.24	20.51	33.18
Lexr	58,712	3.57	2.95	-17.33	22.63	3,204	3.31	3.11	-17.33	22.63
Ltariff	58,712	2.53	0.58	0.00	4.74	3,204	2.59	0.61	0.00	4.74
Ldist	58,712	8.68	0.62	5.12	9.78	3,201	8.73	0.54	7.07	9.73
Colonial relationship post-1945	58,712	0.03	0.18	0.00	1.00					
Common official language	58,712	0.08	0.27	0.00	1.00					

Note: All variables indicated by L in front of their names are expressed in natural logs.

1 We use the latest version of the database, released in April 2016.

We use the World Input Output Database (WIOD) (Timmer et al., 2015). This MRIO table contains IO flows among 35 common sectors located in multiple countries. All EU MSs (except Croatia) are represented. Other large or developed economies, such as Brazil, China and the US, are also shown. Labour inputs by level of skill disaggregated by country and sector have been obtained from the WIOD Socio Economic Accounts. We have used 2011, the last IO table.

WIOD is not the only choice in terms of MRIO. The OECD Inter-Country Input-Output Tables present a similar country and sector coverage. These IOs are used to calculate the Trade in Value Added database. The last IO constructed is for the year 2011. In addition, WIOD presents sectoral and country-compatible data on employment by skills level. Consequently, we have used WIOD as it fits better with the data requirements of this analysis.

In the next section, we present the empirical results of our estimations on the effects of aid on exports. We first demonstrate and discuss the results associated with the aid provided by the EC and then provide complementary results on the effects of aid provided by individual EU MSs. We use both sets of results later to assess the effects of aid on employment.

4. Effects on exports

4.1. Results of EU aid

The results are in line with expectations and previous findings in the literature. Income per capita in the recipient country is associated with higher exports from the EC, explained primarily by a demand effect in the destination country. The effect of the exchange rate is negative and significant. A strong/weak local currency is associated with an increase/decrease in demand for European products. Also, tariffs are associated with a negative and significant effect on EU exports. The higher the tariff applied in the destination country, the lower the volume of exports. Distance also presents a negative and significant relationship with EU exports. The EU tends to export significantly more to countries located in its neighbourhood.

There is a positive and significant relationship between the aid provided by EC and EU exports. A 1% increase in EC disbursements is associated with an increase of exports between 0.007% and 0.016%. These effects may appear small. However, as we will see, they are large in value.

The aggregation of series used in this regression breaks the link between EU MS aid and their exports. The effects of such aggregation are a problem frequently found in this type of analysis. The relationships that exist between variables disappear when the variables are aggregated into either higher frequency in the case of time series (see Haug, 2002) or higher categories in the case of cross-sectional data (see Pakes, 1983). The aggregation does not account for variation in the allocation of different MSs' aid. It does not recognise that there is no trade recorded between some MSs and some recipients. Consequently, the effect of the aggregated aid provided by MSs presents a weak relationship with aggregated exports. Only when the simple OLS model is used is there a positive and significant relationship between the variables. We estimate a disaggregated model later in this section to capture this relationship.

The effect of the aid provided by non-EU countries is unclear. Depending on the econometric method employed, it changes from positive and significant to negative and significant. The theoretical effect, meanwhile, it is also undefined. The aid other countries provide can boost demand to the benefit of all exporters. It could also divert trade from the beneficiaries' normal trade partners, particularly when aid is tied. It is unclear how the aggregation may affect the results in this particular case.

Normally, FE approaches find lower estimates, as the effect of the specific country characteristics are more adequately treated. They tend to be preferred for the estimation of panels. However, when data are aggregated, the FE associated with the relationship between exporter and importer are harder to capture, generating some estimates that, although smaller, are similar to those obtained in the OLS regression.

We also explore a dynamic specification. Our estimates suggest a stronger effect relationship between EC aid and EU exports when these models are used. However, these methods are developed for panels with short time horizons. When applied on longer series, their estimates tend to lose accuracy. Consequently, we have applied the GMM model to subsamples. Although use of this model does not properly address the issues associated with the estimation, it helps assess the evolution of the link between the aid disbursed and exports.

The evolution of the link is contingent on the definition of the periods under study and may be affected by, for example, average export prices. Although the EU exports products whose price sensitivity tends to be smaller than that of the commodities or agricultural products that developing countries export, export prices for these have also gone up. This may be behind the larger estimate found for the relationship between EC aid and export performance between 2005 and 2014. However, we include a time trend to capture the evolution of EU export prices.

The fact that we control for the effect of time allows us to be slightly confident about the evolution of the estimate. Consequently, aid disbursed in the most recent period appears to be linked to EU export performance more strongly than that provided before. The increase in aid associated with trade may be behind this. AfT (untied) not only helps improve export competitiveness in the beneficiary country but also boosts import competitiveness. This effect is not seen in the case of EU MS exports, probably as a result of the aggregation issue.

Table 2. Effects of EC aid disbursements on EU exports – regression results, 1989–2014

	OLS	FE	RE	Difference	GMM
Lodaeu	0.008**	0.007***	0.009***	0.024***	0.016***
	(0.016)	(0.007)	(0.001)	(0.000)	(0.000)
Loda	0.057***	-0.021	0.003	-0.000	0.003*
	(0.000)	(0.129)	(0.877)	(0.962)	(0.077)
Lodaotnoeu	-0.109***	0.022*	0.004	0.013***	-0.023***
	(0.000)	(0.071)	(0.821)	(0.002)	(0.000)
Lgdprec	0.850***	0.483***	0.668***	0.093***	0.280***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lexr	-0.007	-0.024	-0.011	-0.165***	-0.021***
	(0.118)	(0.137)	(0.425)	(0.000)	(0.000)
Ltariff	-0.020	-0.093*	0.018	-0.455***	0.033***
	(0.359)	(0.063)	(0.665)	(0.000)	(0.000)
Ldist	-0.957***				-0.351***
	(0.000)				(0.000)
L.LXus				0.235***	0.685***
				(0.000)	(0.000)
Constant	75.179***	-20.306	19.976		23.071***
	(0.000)	(0.216)	(0.120)		(0.000)
Observations	3201	3204	3204	2951	3084
R-squared	0.876	0.788	0.691		
Adjusted R-squared	0.876	0.778			
Arellano_Bond test for AR(2) in first difference				0.517	0.135
Sargan test				378.56	130.66

*Note: *p<0.10, **p<0.05, ***, p<0.01.*

Table 3. GMM results applied to different periods

	SYSGMM 1989–1995	SYSGMM 1996–2004	SYSGMM 2005–2014
Lodaeu	0.008***	-0.017***	0.016***
	-0.005	-0.001	-0.007
Loda	-0.002	0.104***	-0.011
	-0.654	0	-0.681
Lodaotnoeu	-0.030***	0.021***	-0.025**
	0	0	-0.041
Lgdprec	0.450***	0.187***	0.424***
	0	0	0
Lexr	-0.003	-0.144***	-0.009
	-0.75	0	-0.623
Ltariff	0.175***	-0.013	0.066
	-0.003	-0.78	-0.245
ldist	-0.765***	0.021	-0.322***
	0	-0.681	0
L.LXus	0.482***	0.793***	0.549***
	0	0	0
Constant	24.779***	7.393	-22.323*
	0	-0.302	-0.059
Observations	1188	1131	765
Arellano_Bond test for AR(2) in first difference	0.685	0.381	0.116
Sargan test	295.42	157.16	105.82

*Note: *p<0.10, **p<0.05, ***, p<0.01.*

4.2. Results on the impact of EU MSs' aid on EU MS exports

We want to provide a more comprehensive picture of the effects of aid disbursed by the EU. In addition to accounting for the effect of the aid the EC provides, we would like to assess the effect of the aid provided by its MSs. We have seen that the model we have used to address the effects of EC aid is not appropriate for dealing with the effects of individual states' aid. Consequently, we estimate the model given by equation 2 in a panel that includes the trade and aid flows of each of the EU MSs and the recipient countries. Table 4 presents the result.

The results of the gravity model are in line with the experience and the literature. The effect of GDP in the recipient country is positive and significant for exports across all specifications. The same can be said about income in the donor country. This is not present in our aggregated model, as the effects of income in the EU are captured by the introduction of a time trend. However, in the disaggregated model, GDP in the donor country has a positive effect on exports. This may seem counter-intuitive, as the increase in income should lead to increases in absorption and, consequently, a reduction in exports. However, the empirical evidence in this regard tends to be mixed. A positive donor GDP may be associated with large export capacity, and this could lead to a positive coefficient.

The US dollar/local currency exchange rate, average tariff and distance each show the expected signs. They are all positive and control for important aspects that affect bilateral trade. Given that we use a disaggregated model, we include a series of variables that help control for other structural factors that explain bilateral trade. Existence of a colonial–metropolis relationship and sharing a common language prove positive and significant.

The effect of EC aid is also positive and significant. However, it is smaller than in the aggregate model. In this, aid provided by the EC has the same effect across exporters, varying by year but remaining constant across donors. Consequently, it cannot capture the relationship

with the varying levels of exports between donors and recipients. Therefore, it is expected that the effect in this context will be smaller.

The relationship between aid by EU MSs and their exports is positive and significant. The magnitude of the effect ranges from 0.016% to 0.18% as a result of a 1% increase in aid. This range contains some of the estimates found in the literature. Martínez-Zarzoso et al. (2013a) find that an increase of 1% in the aid disbursed by the Netherlands increases its exports by 0.034% in an FE model. Martínez-Zarzoso et al. (2008) have also found an estimate of 0.082 in the aid provided by Germany. Massa and te Velde (2009) find a coefficient of 0.017, very close to our estimate. This latter work is very relevant as it tries to capture, as in our report, the effect of aid on multiple donors. Country-specific studies present higher estimates consistent with the unique relationship evaluated. In contrast, our study presents an average relationship of aid between multiple donors and recipients.

We include the effect of other EU and non-EU members as explanatory variables. We find negative and significant coefficients in both cases, suggesting exports are negatively related to the aid provided by other countries. This implies that such aid diverts trade away. In country-based models, such as the Dutch case of Martínez-Zarzoso et al. (2013a), the effect of aid provided by other countries is positive. In this case, the competition effect with other countries tends to be minimised as only the Dutch exports are considered. Consequently, aid provided by other EU or non-EU states tends to have a positive effect on the demand associated with the increase of income in the recipient country. In our case, where we are considering multiple donors, aid provided by other donors reduces exports, suggesting the presence of a diversion effect that shows consistency with a positive relationship between the donor aid and its exports to the recipient. Own aid and third country aid are, in this context, linked.

We also analyse the dynamic model presented by equation 2 in our disaggregated panel. Although the econometric issues associated with the use of these techniques in long panels still applies, it is interesting to evaluate the model at different periods of time. Table 5 presents the results.

The link between the aid provided by both the EC and the EU MSs, along with exports, is stronger in the most recent sample. Interestingly, the link between all types of aid and exports is not significant in the intermediate period and is also seen in the aggregated model. This suggests the relationship between aid and exports in the EU has become stronger in recent years. Whether this is as a result of a change in the way of providing aid and the type of aid provided (i.e. more AfT) is hard to assess. The relationship between AfT and exports has been exclusively analysed for recipients but not donors.

There is a positive and significant relationship between the aid provided by the EC and the EU MSs and the exports of the EU. Our next step in this analysis involves translating these effects in the EU external sector into the domestic EU and MS economies. The most direct link is the one that can be found between exports and employment in the EU and its MSs. Pinpointing this is the task of the following section.

Table 4. Effect of EU MS aid disbursements on exports – regression results, 1989–2014

	OLS	FE	RE	Difference	GMM
Lodaeu	0.002***	0.002***	0.001	0.005***	0.003
	(0.006)	(0.004)	(0.237)	(0.009)	(0.317)
Loda	0.092***	0.016***	0.023***	0.025	0.179***
	(0.000)	(0.000)	(0.000)	(0.639)	(0.000)
Lodaoteu	-0.033***	-0.004	-0.007**	0.005	-0.098***
	(0.000)	(0.155)	(0.013)	(0.890)	(0.000)
Lodaotnoeu	-0.043***	-0.000	0.000	0.005	-0.034***
	(0.000)	(0.945)	(0.903)	(0.686)	(0.000)
Lgdprec	0.943***	0.779***	0.877***	0.621***	0.653***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lgdpdon	1.072***	0.540***	1.002***	0.344***	0.686***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lexr	-0.032***	-0.025***	-0.018***	-0.047	-0.027*
	(0.000)	(0.000)	(0.002)	(0.129)	(0.072)
Ltariff	-0.163***	-0.042*	-0.051**	0.493***	-0.025
	(0.000)	(0.079)	(0.019)	(0.002)	(0.714)
Ldist	-1.194***		-1.372***		-0.522***
	(0.000)		(0.000)		(0.000)
Colonial relationship post 1945	0.480***		0.959***		0.490
Common official language	0.859***		1.043***		1.527***
	(0.000)		(0.000)		(0.001)
Time	-0.066***	-0.011***	-0.047***	0.011	-0.009***
	(0.000)	(0.000)	(0.000)	(0.215)	(0.000)
L.LXus				0.172***	0.307***
				(0.000)	(0.000)
Constant	109.201***	6.162	75.123***		
	(0.000)	(0.254)	(0.000)		
Observations	58712	58712	58712	50035	54159
R-squared	0.754	0.254	0.248		
Adjusted R-squared	0.754	0.254			
Arellano_Bond test for AR(2) in first difference				0.372	0.01
Sargan test				243.22	259.86

*Note: *p<0.10, **p<0.05, ***, p<0.01.*

Table 5. GMM results applied for different periods – disaggregated model

	SYSGMM 1989–1995	SYSGMM 1996–2004	SYSGMM 2005–2014
Lodaeu	0.002	0.002	0.021**
	(0.696)	(0.805)	(0.029)
Loda	0.198**	0.114	0.234**
	(0.035)	(0.124)	(0.010)
Lodaoteu	-0.119*	-0.062	-0.135**
	(0.060)	(0.201)	(0.029)
Lodaotnoeu	-0.045***	0.001	-0.016
	(0.000)	(0.957)	(0.609)
Lgdprec	0.647***	0.651***	0.503***
	(0.000)	(0.000)	(0.000)
Lgdpdon	0.806***	0.828***	0.457**
	(0.000)	(0.000)	(0.024)
Lexr	-0.002	0.010	-0.057*
	(0.950)	(0.797)	(0.085)
Ltariff	-0.272*	0.014	0.365**
	(0.077)	(0.930)	(0.013)
Ldist	-0.783***	-0.246	-0.481**
	(0.000)	(0.110)	(0.020)
Colonial relationship post 1945	-0.574	-2.664	1.145
	(0.827)	(0.213)	(0.349)
Common official language	3.064***	-0.007	0.347
	(0.008)	(0.996)	(0.714)
Time	-0.009***	-0.012***	-0.005*
	(0.000)	(0.000)	(0.086)
L.LXus	0.279***	0.285***	0.395***
	(0.000)	(0.000)	(0.000)
Observations	27521	20115	6523
R-squared			
Adjusted R-squared			
Arellano_Bond test for AR(2) in first difference	0.01	0.326	0.075
Sargan test	87.87	75.15	30.4

*Note: *p<0.10, **p<0.05, ***, p<0.01.*

5. Effects on employment

The Leontief equation (equation 3) presented in Section 3 tries to identify the amount of labour input necessary to meet a final demand vector. The exercise in this section involves calculating the numbers of workers necessary to produce the exports generated by the aid provided. We separately consider the aid provided by the EC and that provided by the EU MSs.

To continue with the analysis, we need to assume the existence of causality between aid provided and exports. Although strong theoretical foundations back the causality, the econometric analysis can only establish the existence of a relationship between the two variables, without pointing to causality. Nonetheless, in order to address the effect of aid on employment, we need to assume that it impacts on exports to beneficiary countries to the same degree established by the regressions estimated in the previous section.

However, the coefficients estimated are elasticities and, as such, they are not suitable for use in the IO analysis. They need to be translated into trade multipliers – that is, the effect on the value of exports of an increase in the value of aid. This can be easily calculated from the definition of elasticity.

$$\varepsilon = \frac{\Delta LXus}{\Delta Lodaeu}\frac{Lodaeu}{LXus}$$

Here, ε is the elasticity estimated in any of the equations from the previous section. Assuming the mean values of *LXus* and *Lodaeu*, the multiplier of aid on exports is defined as:

$$\frac{\Delta LXus}{\Delta Lodaeu} = \varepsilon^* \frac{\overline{LXus}}{\overline{Lodaeu}}$$

This expression tells us how an increase in a unit of disbursed aid affects exports. We can multiply this multiplier by the actual value of aid in a given year to obtain the value of exports this generates. We take the mean values of exports and aid disbursed by the EC to obtain the trade multipliers in Table 6. This suggests the effect of a $1 increase in aid increases EU exports by between $1.02 and $3.69.

Similarly, we need to estimate the multiplier effect of EU MS aid on its own exports (Table 7). The multiplier will have different values depending on the country. Although we can have average values of aid provided by EU MSs and their exports, we have obtained a single estimation for the elasticity. This represents the average effects across donors. Consequently, multiplier effects in each of the EU MSs present a large degree of dispersion. In the countries that provide little aid (Bulgaria and Malta), the value of the multiplier tends to be very big, as their exports are large in comparison to their aid. This dispersion can be avoided by estimating individual models for each EU MS.

In the main donors, the multiplier tends to be smaller and presents values closer to the average effect. For example, under the FE model, the Netherlands presents a multiplier of 0.29, similar to that estimated by Martínez-Zarzoso et al. (2013a). In Germany, $1 of aid will generate exports by $0.46. This figure is lower than that found by Martínez-Zarzoso et al. (2008) and Massa and te Velde (2009). The multiplier for France (0.30) is similar to the one found by Massa and te Velde (2009). Although the dispersion of estimates may appear large, we are confident it will not distort the employment effects. Those countries that present large multipliers will also show low levels of aid and, consequently, low export levels.

Table 6. EU aid–trade multiplier

Estimation method	Elasticity	Multiplier (unit increase in exports for unit increase on aid)
OLS	0.0081	1.23
FE	0.0068	1.02
RE	0.0090	1.36
Diff	0.0245	3.69
GMM	0.0164	2.47

Note: Average exports 1989–2014 (in US$) 3,380,000,000. Average EC aid 1989–2014: 22,400,000.

Table 7. EU MS aid–trade multiplier

	Average exports 1989–2014 ($ '000s)	Average aid (1989–2014) ($ '000s)	Aid 2014 ($ '000s)	Trade multiplier OLS	FE	RE	DIFF	GMM
Austria	57,600	2,646	348,000	2.00	0.34	0.51	4.03	3.90
Belgium	256,000	3,941	542,000	5.96	1.01	1.51	12.04	11.65
Bulgaria	54,100	15	590	330.27	55.82	83.61	667.63	645.79
Cyprus	1,443	12	-	11.36	1.92	2.88	22.97	22.22
Czech Republic	44,100	317	47,300	12.76	2.16	3.23	25.80	24.95
Denmark	42,800	6,050	945,000	0.65	0.11	0.16	1.31	1.27
Estonia	6,484	19	9,290	31.67	5.35	8.02	64.02	61.93
Finland	56,500	2,078	484,000	2.49	0.42	0.63	5.04	4.87
France	448,000	23,500	2,780,000	1.75	0.30	0.44	3.53	3.42
Germany	857,000	28,900	5,590,000	2.72	0.46	0.69	5.50	5.32
Greece	37,900	565	13,100	6.15	1.04	1.56	12.44	12.03
Hungary	47,900	125	8,830	35.16	5.94	8.90	71.08	68.76
Ireland	38,800	1,684	384,000	2.11	0.36	0.53	4.27	4.13
Italy	384,000	5,404	382,000	6.52	1.10	1.65	13.17	12.74
Latvia	6,741	7	1,680	88.86	15.02	22.50	179.64	173.76
Lithuania	21,100	64	3,000	30.12	5.09	7.63	60.89	58.90
Luxembourg	7,069	1,143	206,000	0.57	0.10	0.14	1.15	1.11
Malta	4,915	0	610	1,192.29	201.53	301.85	2,410.22	2,331.36
Netherlands	207,000	11,100	730,000	1.71	0.29	0.43	3.46	3.34
Poland	84,400	318	59,200	24.33	4.11	6.16	49.17	47.56
Portugal	31,700	841	99,800	3.46	0.58	0.88	6.99	6.76
Romania	49,100	83	66,900	54.25	9.17	13.73	109.67	106.08
Slovakia	20,600	69	6,020	27.35	4.62	6.92	55.29	53.48
Slovenia	17,400	21	7,600	75.40	12.74	19.09	152.42	147.44
Spain	183,000	5,750	365,000	2.92	0.49	0.74	5.90	5.71
Sweden	88,400	7,414	1,460,000	1.09	0.18	0.28	2.21	2.14
UK	298,000	21,000	5,900,000	1.30	0.22	0.33	2.63	2.54
Average	124,150	4,558	20,439,921	1.12	0.19	0.28	2.27	2.20

Note: Exports exclude intra EU trade.

Source: Own elaboration based on econometric estimations and OECD aid database and EU ComExt.

Table 8. Average composition of EU exports to the rest of the world

Sector	Weight
Agriculture, hunting, forestry and fishing	2.3%
Air transport	0.0%
Basic metals and fabricated metal	10.9%
Chemicals and chemical products	11.3%
Coke, refined petroleum and nuclear fuel	5.5%
Construction	0.0%
Education	0.0%
Electrical and optical equipment	14.1%
Electricity, gas and water supply	0.0%
Financial intermediation	0.0%
Food, beverages and tobacco	10.0%
Health and social work	0.0%
Hotels and restaurants	0.0%
Inland transport	0.0%
Leather, leather and footwear	0.6%
Machinery, nec	11.4%
Manufacturing, nec; recycling	1.3%
Mining and quarrying	1.5%
Other community, social and personal services	0.0%
Other non-metallic mineral	1.6%
Other supporting and auxiliary transport activities; activities of travel agencies	0.0%
Post and telecommunications	0.0%
Private households with employed persons	0.0%
Public admin and defence; compulsory social security	0.0%
Pulp, paper, paper, printing and publishing	5.3%
Real estate activities	0.0%
Renting of machinery and equipment and other business activities	0.0%
Retail trade, except motor vehicles and motorcycles; repair of household goods	0.0%
Rubber and plastics	4.0%
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	0.0%
Textiles and textile products	2.0%
Transport equipment	17.3%
Water transport	0.0%
Wholesale and commission trade, except motor vehicles and motorcyles	0.0%
Wood and wood and cork products	1.1%

Source: Own elaboration based on Timmer et al. (2015). Low-income countries are included in the definition of rest of the world in WIOD.

The third column of Table 7 provides the last value of total aid (2014) disbursed by each EU MS. We use these values and multiply them by the respective multipliers to obtain the value of exports generated. For example, in the case of the FE model, Austrian aid generated $118,320,000 of exports in 2014. We obtain this export value by multiplying the value of aid in 2014 ($348,000,000) by the multiplier from the FE model (0.34). These exports are distributed in the IO sectors according to their share in exports in each EU MS. As we estimate gravity models on goods trade, we have not considered the services in the distribution of these exports. Nevertheless, as we will see, there will be effects in employment in the services sector as well.

We use average aid provided by the EC to calculate the exports generated. According to Carreras et al. (2016), aid committed by the EU over 2013–2020 is around €77 billion. Consequently, the aid provided in a single year is estimated at €11 billion. Adjusted by the average 2012–2014 dollar/euro exchange rate, aid provided by the EC stands at $13,860 million.

Using the multipliers in Table 6, we calculate their effect on exports. These exports are distributed according to the share each sector in each EU MS has in total EU exports. Therefore, we capture simultaneously the magnitude of the sector and the EU MS. We exclude the services sector in the allocation. In addition, we exclusively consider extra-EU trade in calculation of the shares. Table 8 presents the average distribution of EU exports to the rest of the world. This gives an idea of the first operating channels of those exports.

Table 9 summarises the effects of employment. These are disaggregated according to level of skill. The effect varies significantly according to the methodology employed. However, we see that the FE of the econometric estimations and their associated multipliers present a certain consistency across various similar exercises. Therefore, we believe they may present a more accurate representation of the true effects.

EC aid generates approximately 141,000 jobs, through its effects on exports. This represents around 0.06% of total employment in the EU. Half of these jobs are generated among middle-skilled workers (upper-secondary and post-secondary non-tertiary education). A total of 38,000 jobs are generated among low-skilled workers (lower-secondary/second stage of basic education or less). Finally, 31,000 jobs are generated among high-skilled workers (more than first stage of tertiary education). The skill classifications are based on the International Standard of Education (Erumban et al., 2012).

Aid disbursed by EU MSs generates 105,000 jobs (using the FE model). These represent nearly 0.05% of total employment in the EU, distributed at roughly 40% for low-skilled workers, 40% for middle-skilled workers and 20% for high-skilled workers. The appendix presents the distribution of these jobs in each of the EU MSs for both the aid provided by the EC and that provided by the EU MSs.

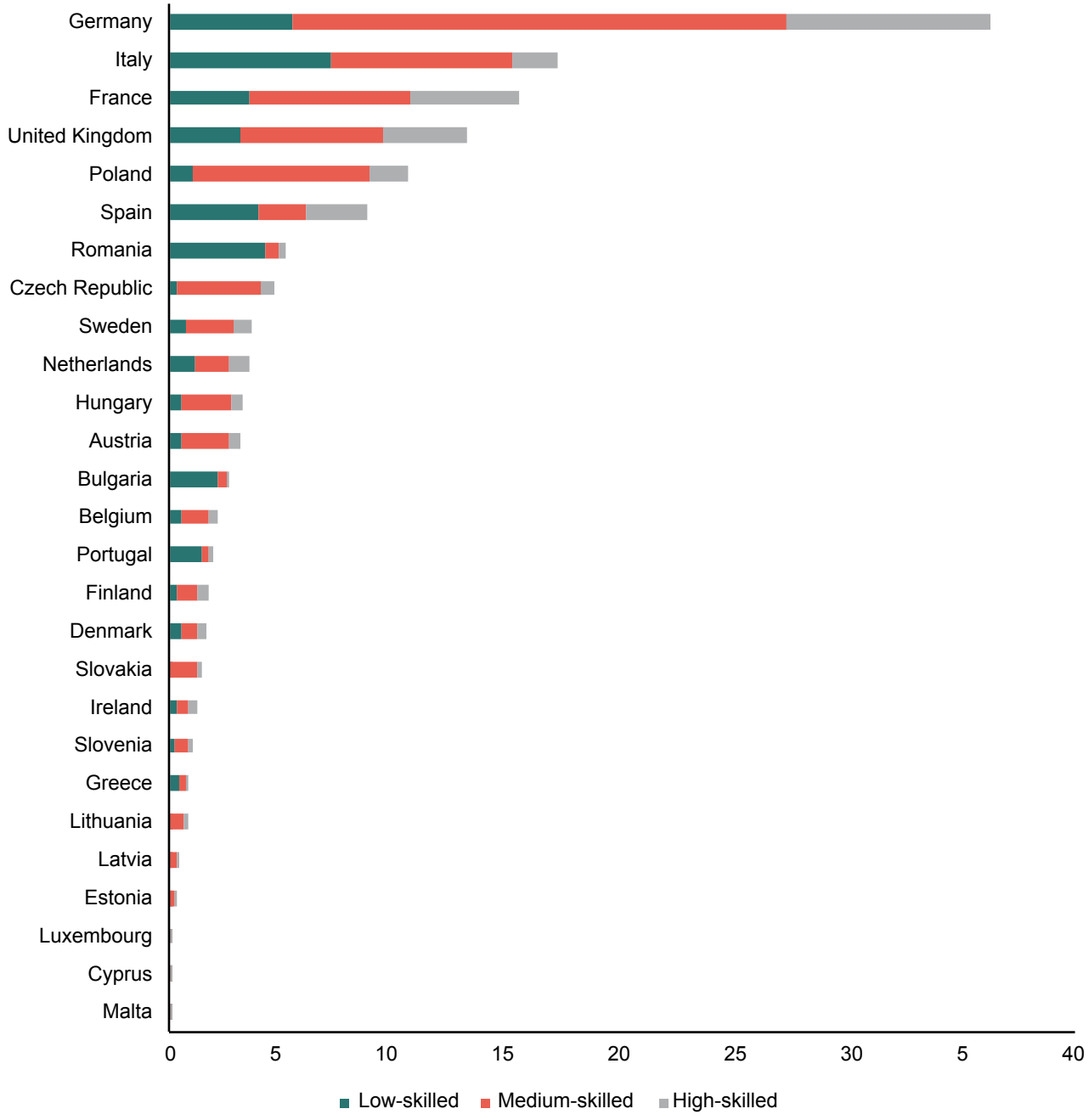
Table 9. Effects of development assistance on employment in the EU (in thousands of jobs)

	Low-skilled	Middle-skilled	High-skilled	Total	Change
BASE	58,971	107,225	63,230	229,426	
Effects of EC aid					
OLS	45	87	37	169	0.07%
FE	38	73	31	141	0.06%
RE	50	97	41	187	0.08%
DIFF	136	498	262	897	0.39%
GMM	91	482	175	748	0.33%
Effects of MS aid					
OLS	246	264	111	621	0.27%
FE	42	45	19	105	0.05%
RE	62	67	28	157	0.07%
DIFF	498	534	225	1,256	0.55%
GMM	482	516	217	1,215	0.53%

Based on comparison of the value of EU aid and the total of that of the EU MSs, we might be tempted to say the aid provided by the EC tends to generate larger employment effects. Out of around $20 billion, EU MS aid has generated 105,000 jobs, while the EC, with almost $14 billion, has generated 141,000. However, we are not extracting this coefficient from common estimations. Different panels have been used on each occasion.

The employment effect differs by country depending on productivity and labour structure. Figure 1 presents the distribution of the employment effects generated by EC aid. More detailed data and the effects of aid provided by the EU MSs can be found in the appendix. Germany is the country where the employment effects (in absolute terms) are largest, particularly among middle-skilled workers. Italy is the second most affected, with the largest effect generated among both low- and middle-skilled workers.

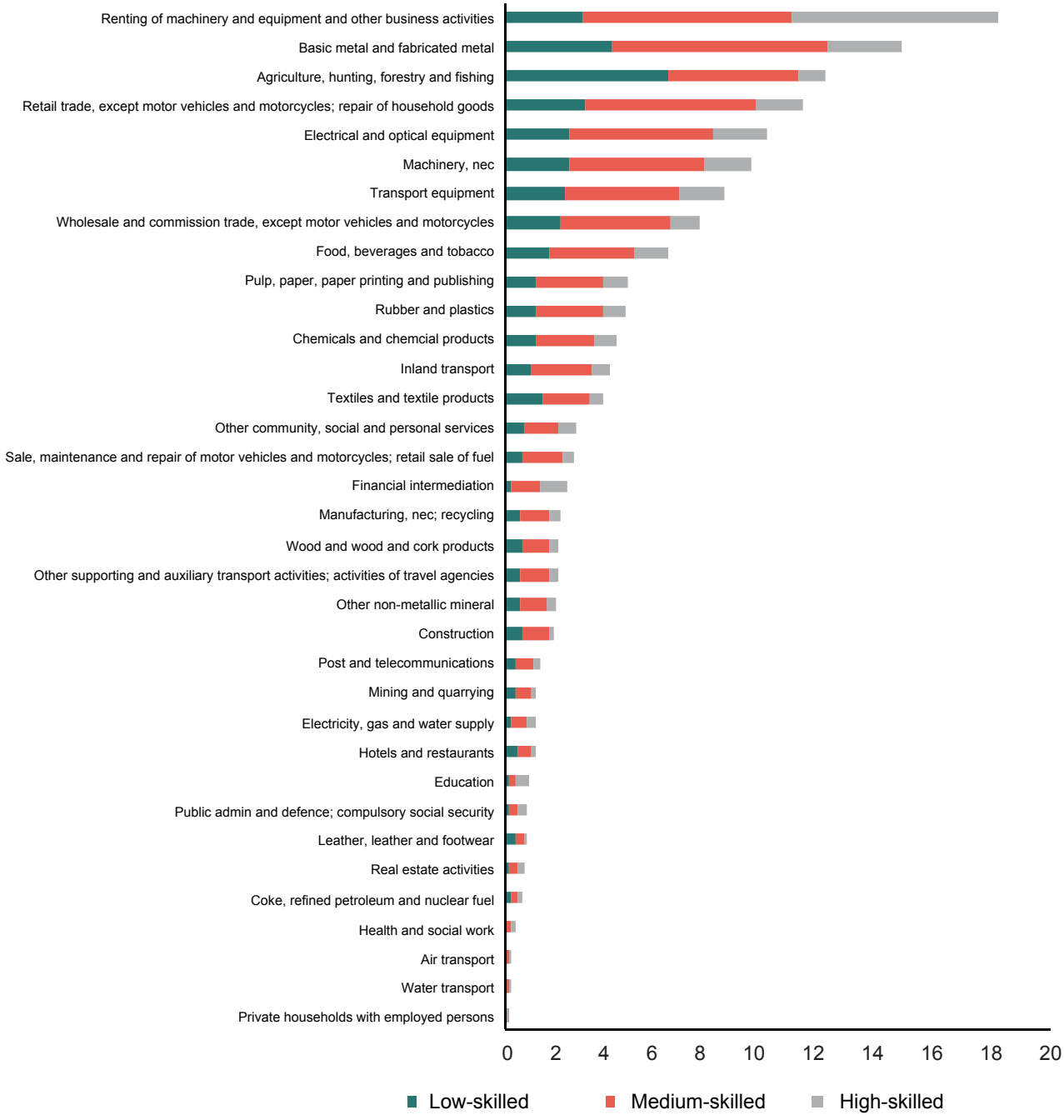
Figure 1. EC aid job effects by country per year (in thousands)



In other countries (e.g. Bulgaria and Romania), employment is generated primarily among low-skilled workers. In the Czech Republic and Poland, the effect is seen mainly among middle-skilled workers. The different effects depend on the structure of exports to the rest of the world and on the existence of production linkages between EU MSs. In the first case, aid increases employment directly in sectors where exports have grown. In the second case, the increase in employment is associated with the provision of inputs to the imported sector. Baldwin and Lopez-Gonzalez (2015) have analysed the value chain links within Europe.

Although we have not considered exports of services, exported goods require inputs from both other goods and the services sector. Consequently, the employment effects will also be present in the services sector. Figure 2 presents the distribution of the employment effects of the aid the EC provides. The appendix presents more detailed results, and those relating to the effects of the aid provided by the EU MSs. The area with the most jobs generated tends to be the machinery and equipment rentals sector, along

Figure 2. EC aid job effects by sector (in thousands)



with other services. This sector is not affected directly by exports. However, it provides inputs into all sectors of the domestic economy and also, through links to other EU countries, into their production processes. Consequently, the effects are not limited to the sector that generated the exports. In fact, these tend to be bigger in other sectors. Notably, the creation of employment among high-skilled workers in the sector generating the exports is greater. In general, the effects on employment are particularly high among middle-skilled workers. However, in sectors such as agriculture, hunting, forestry and fishing, the effect among low-skilled workers is particularly high as these areas are particular intensive in the use of low-skilled labour.

Moreover, as we are using an MRIO table, the effects of aid provided by an MS, in terms of employment, go beyond its domestic market. Exports from an EU MS require inputs (goods and services) produced locally and in other countries. Given the strong value chains links that exist within the EU, or 'Factory Europe', as Baldwin (2011) calls it, jobs will also be created in other EU MSs.[2]

2 As EU firms use inputs from other regions as well, EU aid will also generate jobs in other countries. For example, under the FE model, EC aid would generate 26,000 jobs in China.

6. Conclusions

The effects of aid are not limited to the economies of recipient countries. Aid can affect the real economy in the donor countries too. Although the amount of aid may seem small in comparison with income or government budgets in donor countries, it can have non-negligible effects on exports and employment in these countries.

Exports constitute the main and direct channel through which EC aid will affect the economy and employment within the EU. This report provides estimates of the effect on exports of both EC aid and EU MS aid. In general, we have found that, for every $1 the EC spends on aid, EU exports will expand by between $1.02 and $3.69. This means an elasticity of exports to aid of between 0.007 and 0.024.

Using actual levels of aid and the estimated elasticities, we have made preliminary estimates of the effect on exports of the aid provided by the EC and the EU in each of the EU MSs. Using an MRIO table, we have calculated the effect of the aid provided by the EC and the EU MS on employment at the sectoral, country and aggregated levels, distinguishing according to the qualifications of the workforce. The MRIO table allows us to capture the nature of the economic integration and the value chain dimension within the EU economy.

On the basis of these estimates, average annual aid provided by the EC (approximately $14 billion or €11 billion) sustains around 141,000 jobs in the EU or approximately 0.06% of the EU workforce. Around 80% of these jobs are generated among workers with low- or middle-level skills. Germany, Italy and France (in that order) present the highest employment impacts measured in terms of the number of jobs generated. Most of the employment generated among the lowest-skilled workers is in Italy, Spain and Romania. This job expansion effect must be added to the approximately 105,00 jobs in the EU generated by the aid provided by the EU MSs.

Although exports of services are not considered in the econometric estimations and, consequently, in the affected trade in the IO analysis, the main affected sector in the EU in terms of the generation of employment is business services. This reflects the value chain and production fragmentation in the EU integration process. The area of basic metals and fabricated metals, along with agriculture, hunting, fishing and forestry, are among the top generators of employment. In the latter, the number of low-skilled jobs generated is of particular importance.

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Appendix

Table A1. Jobs generated by EC and EU MS aid by country (in thousands of jobs)

Country	Base levels of employment			Employment generated by EC aid			Employment generated by EU MS		
	Low-skilled	Middle-skilled	High-skilled	Low-skilled	Middle-skilled	High-skilled	Low-skilled	Middle-skilled	High-skilled
Austria	701.11	2,745.00	848.84	0.55	2.05	0.48	0.23	0.85	0.20
Belgium	883.52	2,631.32	1,015.50	0.49	1.25	0.41	0.58	1.45	0.47
Bulgaria	2,379.37	643.70	439.90	2.10	0.38	0.17	1.41	0.25	0.11
Cyprus	97.74	157.33	139.23	0.03	0.04	0.02	0.00	0.00	0.00
Czech Republic	275.83	3,975.62	895.93	0.29	3.77	0.52	0.13	1.68	0.23
Germany	6,037.11	24,197.95	11,751.57	5.44	21.78	9.04	3.24	12.99	5.39
Denmark	697.14	1,160.78	880.89	0.48	0.72	0.40	0.23	0.35	0.19
Spain	7,245.66	4,400.76	6,600.76	3.94	2.05	2.71	1.08	0.57	0.77
Estonia	53.96	318.72	244.23	0.04	0.21	0.10	0.11	0.62	0.30
Finland	381.80	1,150.57	960.51	0.31	0.87	0.58	0.26	0.72	0.48
France	5,792.32	11,090.87	8,682.56	3.57	7.02	4.83	1.53	3.01	2.08
UK	6,507.14	14,869.88	11,511.38	3.11	6.33	3.70	2.80	5.68	3.25
Greece	1,792.92	2,041.90	1,348.52	0.40	0.33	0.14	0.12	0.10	0.04
Hungary	502.90	2,592.32	926.66	0.50	2.21	0.49	0.23	1.01	0.23
Ireland	393.24	732.89	769.04	0.29	0.48	0.42	0.11	0.19	0.17
Italy	9,202.22	11,524.81	4,369.02	7.17	8.00	1.99	2.16	2.44	0.61
Lithuania	74.60	783.84	557.23	0.06	0.54	0.20	0.03	0.25	0.09
Luxembourg	87.81	158.63	128.06	0.02	0.04	0.03	0.04	0.07	0.04
Latvia	80.97	493.41	282.14	0.06	0.26	0.09	0.07	0.35	0.12
Malta	107.48	38.53	27.56	0.04	0.01	0.01	0.75	0.18	0.09
Netherlands	2,256.44	3,765.35	2,794.41	1.13	1.52	0.84	0.65	0.88	0.49
Poland	1,232.17	10,437.00	4,078.77	1.01	7.79	1.73	0.64	4.94	1.09
Portugal	3,290.08	968.95	762.37	1.42	0.30	0.16	0.94	0.20	0.10
Romania	7,890.52	1,717.71	1,064.32	4.20	0.65	0.30	23.66	3.34	1.53
Slovakia	87.27	1,737.34	425.94	0.05	1.15	0.17	0.03	0.62	0.09
Slovenia	121.05	570.98	241.63	0.18	0.66	0.18	0.26	0.92	0.25
Sweden	798.27	2,319.10	1,482.94	0.73	2.09	0.80	0.33	0.96	0.37
Grand total	**58,970.64**	**107,225.28**	**63,229.91**	**37.62**	**72.52**	**30.51**	**41.63**	**44.62**	**18.7**

Source: Own calculations based on own estimations.

Table A2. Jobs generated by EC and EU MS aid by sector (in thousands of jobs)

Sector	Base levels of employment			Employment generated by EC aid			Employment generated by EU MS		
	Low-skilled	Middle-skilled	High-skilled	Low-skilled	Middle-skilled	High-skilled	Low-skilled	Middle-skilled	High-skilled
Agriculture, hunting, forestry and fishing	7,049	4,225	890	5.99	4.72	1.03	13.27	2.90	0.71
Air transport	165	300	120	0.03	0.07	0.03	0.02	0.04	0.02
Basic metals and fabricated metal	1,527	2,894	1,018	3.90	7.88	2.75	3.19	4.70	1.66
Chemicals and chemical products	501	904	360	1.11	2.13	0.81	0.88	1.24	0.45
Coke, refined petroleum and nuclear fuel	107	163	68	0.19	0.27	0.11	0.37	0.23	0.10
Construction	5,965	8,174	1,868	0.57	1.00	0.20	0.44	0.61	0.13
Education	1,350	4,250	10,158	0.06	0.24	0.57	0.04	0.14	0.32
Electrical and optical equipment	887	1,829	656	2.29	5.33	1.99	1.52	3.05	1.19
Electricity, gas and water supply	259	967	493	0.17	0.61	0.31	0.29	0.47	0.26
Financial intermediation	464	3,375	2,873	0.15	1.14	0.94	0.11	0.71	0.58
Food, beverages and tobacco	1,399	2,408	897	1.59	3.15	1.22	1.11	1.98	0.75
Health and social work	3,600	9,350	8,575	0.05	0.15	0.14	0.05	0.10	0.09
Hotels and restaurants	3,935	5,053	1,062	0.40	0.55	0.10	0.25	0.32	0.06
Inland transport	1,849	3,631	1,184	0.96	2.18	0.67	0.80	1.41	0.43
Leather, leather and footwear	241	219	66	0.34	0.31	0.09	0.33	0.17	0.05
Machinery, nec	1,076	2,113	751	2.35	4.88	1.73	1.71	2.77	1.04
Manufacturing, nec; recycling	641	1,016	349	0.55	1.05	0.36	0.48	0.63	0.22
Mining and quarrying	217	373	110	0.32	0.58	0.20	0.58	0.45	0.19
Other community, social and personal services	3,228	5,208	3,036	0.64	1.23	0.68	0.46	0.73	0.40
Other non-metallic mineral	428	717	247	0.51	1.02	0.33	0.34	0.59	0.20
Other supporting andauxiliary transport activities; activities of travel agencies	935	1,956	631	0.48	1.09	0.34	0.30	0.65	0.20
Post and telecommunications	1,084	2,092	728	0.34	0.70	0.23	0.32	0.48	0.16
Private households with employed persons	1,218	1,665	800	0.00	0.00	0.00	0.00	0.00	0.00
Public admin and defence; compulsory social security	2,472	7,302	5,652	0.11	0.36	0.31	0.06	0.21	0.18
Pulp, paper, paper, printing and publishing	655	1,230	492	1.05	2.49	0.95	0.84	1.61	0.61
Real estate activities	686	1,778	1,998	0.10	0.29	0.29	0.07	0.19	0.20
Renting of machinery and equipment and other business activities	4,228	10,761	11,279	2.78	7.73	7.55	1.64	4.42	4.26
Retail trade, except motor vehicles and motorcycles; Repair of household goods	5,202	9,716	2,799	2.86	6.31	1.75	2.28	3.90	1.06
Rubber and plastics	428	893	313	1.07	2.48	0.86	0.82	1.44	0.51

Sector	Base levels of employment			Employment generated by EC aid			Employment generated by EU MS		
	Low-skilled	Middle-skilled	High-skilled	Low-skilled	Middle-skilled	High-skilled	Low-skilled	Middle-skilled	High-skilled
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	1,386	2,935	827	0.60	1.48	0.40	0.37	0.89	0.24
Textiles and textile products	1,008	1,021	303	1.33	1.76	0.49	2.67	1.30	0.40
Transport equipment	844	1,699	637	2.18	4.14	1.67	2.76	2.68	1.11
Water transport	129	233	88	0.02	0.05	0.01	0.02	0.03	0.01
Wholesale and commission trade, except motor vehicles and motorcyles	3,475	6,169	1,718	1.96	4.07	1.10	2.00	2.70	0.73
Wood and wood and cork products	335	608	185	0.56	1.05	0.31	1.26	0.86	0.28
Total	**58,970.64**	**107,225.28**	**63,229.91**	**37.62**	**72.52**	**30.51**	**41.63**	**44.62**	**18.77**

Source: Own calculations based on own estimations.

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Overseas Development Institute
203 Blackfriars Road
London SE1 8NJ
Tel +44 (0) 20 7922 0300
Fax +44 (0) 20 7922 0399

odi.org