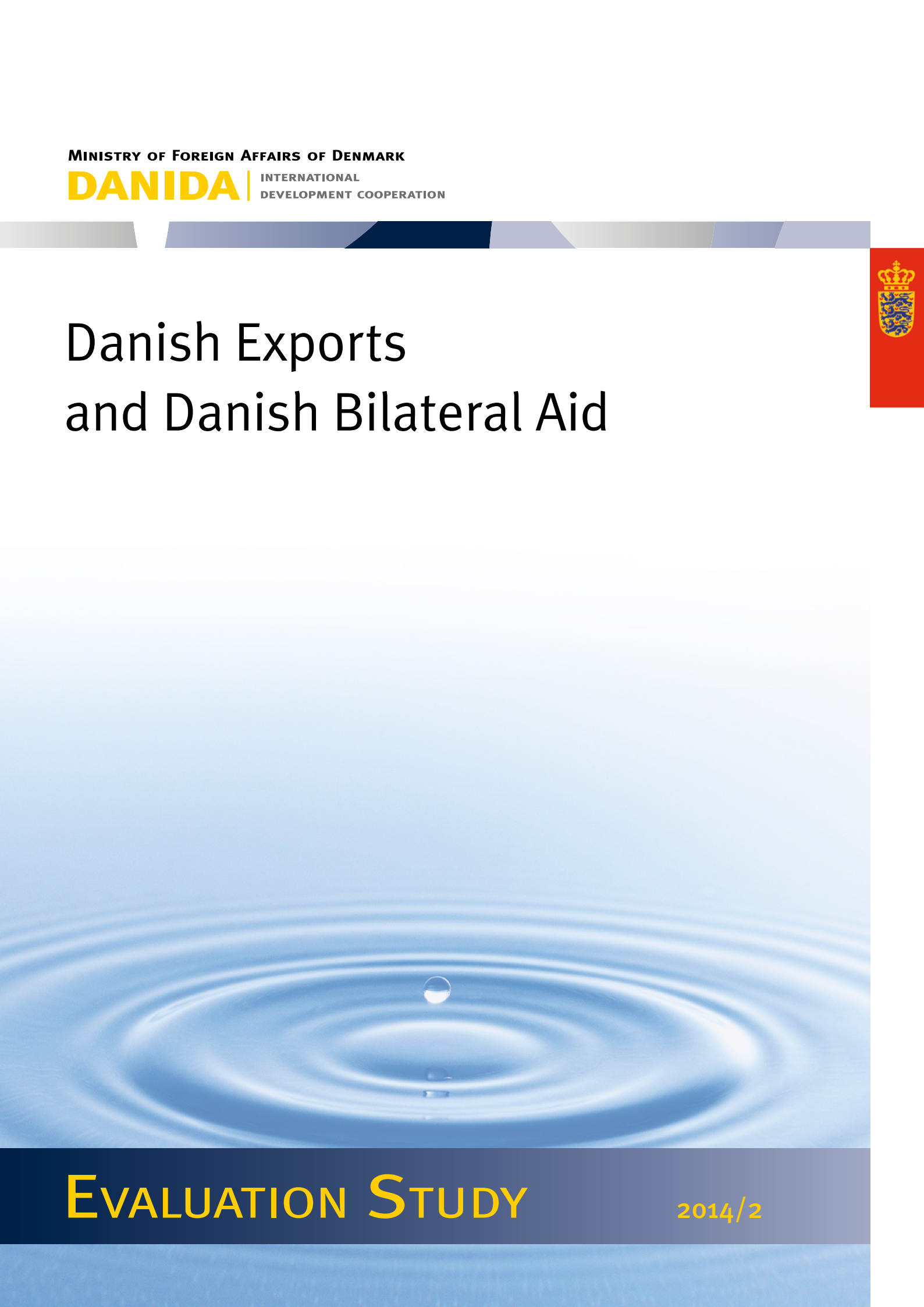
MINISTRY OF FOREIGN AFFAIRS OF DENMARK
DANIDA | INTERNATIONAL DEVELOPMENT COOPERATION

Danish Exports and Danish Bilateral Aid



EVALUATION STUDY 2014/2

Evaluation Study

Danish Exports and Danish Bilateral Aid

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Udviklingsbistand og eksport

Hovedkonklusioner

- Dansk bilateral bistand har en positiv effekt på dansk eksport
- Denne positiv effekt svarer til, hvad man finder i tilsvarende studier for andre lande
- For hver ekstra krone i bistand vokser eksporten i gennemsnit med 30 øre. Det svarer til effekten for et tilsvarende studie for Nederlandene.
- Dette gennemsnit dækker over meget store forskelle mellem hvilke lande bistanden gives til.

Resumé

Danmarks bilaterale udviklingsbistand har til formål at reducere fattigdom i partnerlandene. Bilateral bistand kan imidlertid godt have sekundære eller afsmittende effekter til gavn for Danmark. En vigtig sekundær effekt er udsigten til øget eksport fra Danmark til partnerlandene. Nærværende evalueringsstudie fremlægger en økonometrisk analyse af dansk eksport til 144 lande i perioden 1981 - 2010. Analysen er baseret på gravitationsmodellen for bilateral handel – en strukturel model, som er udviklet gennem de seneste årtier, og som nu er den vigtigste model til analyse af bilaterale handelsstrømme og handelspolitikker. Studiets centrale resultater er, at den bilaterale danske bistand har en positiv og statistisk signifikant indvirkning på Danmarks eksport til modtagerlandene.

Bilateral udviklingsbistand kan påvirke eksporten ad forskellige kanaler. Tre af de vigtigste kanaler er: Direkte binding af bistand; højere indkomster hos modtagerlandet og deraf følgende øget import; faldende omkostninger i forbindelse med handel f.eks. som følge af bedre information om kulturelle og administrative sædvaner og praksis. Bilateral bistand har lige som handelspræferenceordninger en dobbelt effekt på handel. På den ene side skabes handel fordi indkomsten stiger og det er positivt for alle lande, samtidig fører bistand til, at handelsstrømme ændres, idet bistand fører til mere handel med donor på bekostning af handel med andre. Dette er der taget højde for ved at inddrage den samlede donorbistand.

Nærværende evalueringsstudie sammenfatter kort resultaterne af ni andre økonometriske studier af bilateral bistand og eksport. Fem af studierne opstiller skøn over virkningen af udviklingsbistand på bilateral handel for grupper af donorer, mens de øvrige fire studier giver et skøn over virkningen for et

enkelt donorland. Alle gruppestudierne omfatter Danmark. Der er bemærkelsesværdigt stor overensstemmelse mellem studiernes konklusioner om sammenhængen mellem bistand og eksport. Alle ni studier når frem til, at bilateral bistand har en statistisk signifikant indvirkning på eksport til modtagerlandene. Indvirkningen er dog ikke statistisk signifikant for alle perioder i alle studier; det gælder også for Danmarks vedkommende, men de overordnede resultater er overraskende velfunderede i de foreliggende data for de seneste 30 – 50 år.

Interesseparameteren i de økonometriske modeller opstiller et skøn over den procentvise stigning i eksporten efter en procentvis stigning i bistand til et bestemt land (eksport/bistands-elasticiteten) eller efter en procentpointstigning i bistand i forhold til den disponible bruttonationalindkomst i det givne land (eksport/bistand semi-elasticiteten). Dette peger i retning af, at det skønnede afkast i dollars i form af øget eksport per krone i yderligere bistand varierer over tid og fra land til land.

Det overordnede skønnede gennemsnitsafkast i form af stigende eksport ligger på omkring 30 øre per bistands-krone, når man anvender modelformuleringer og metoder, som er direkte sammenlignelige med de eksisterende studier. Det overordnede gennemsnit dækker over store forskelle, fra 5 øre per bistandskrone i de danske prioritetslande til 1,5 krone per bistandskrone for de lande, der er omfattet af Naboskabsprogrammet. Disse resultater afspejler, at indvirkningen af yderligere bistand på eksporten vil være højere, hvis eksporten allerede er betydelig set i forhold til bistanden til et givet land (bistand/eksport ratioen). Når man anvender en alternativ specifikation, hvor der opstilles et skøn over den procentvise forøgelse af eksporten efter en ét procentpoints forøgelse af bistanden i bistand/bruttonationalindkomst-ratioen, giver det noget lavere resultater – 8 øre i stigning i eksport for hver krone i øget bistand til prioritetslandene og 24 øre i landene under Naboskabsprogrammet.

Studiet peger også i retning af, at bistandens effekt på eksporten var meget højere i 1980'erne end senere, især det seneste årti. Det kan have at gøre med faktorer så som afbinding af bistand i den samme periode.

Den økonometriske metode har to vigtige begrænsninger. For det første kan modellen alene sige noget om marginale ændringer i bistanden. Eftersom en beslutning om at give bilateral bistand til et land ikke er en marginal beslutning, bør effekten ikke vurderes på grundlag af studiets resultater. Man kan heller ikke på grundlag af regressionsanalysen udlede noget om effekten på eksporten af en beslutning om at ophøre med bistand til et land. Resultaterne af nærværende evalueringsstudie er således ikke anvendelige i forbindelse med landevalg i dansk bistand. For det andet gælder, at selvom eksportafkastet er positivt, er det vanskeligt at give et præcist skøn over omfanget for enkeltlande eller

for grupper af lande. Forfatterne af nærværende studie foretrækker således klart en modelformulering, som peger i retning af et begrænset overordnet gennemsnitseksportafkast (8 øre per krone) og et begrænset afkast for landene under Naboskabsprogrammet (24 øre per krone), men den anden modelformulering kan dog ikke afvises. Usikkerhed om modellen fører således til en ganske væsentlig usikkerhed hvad angår det landespecifikke eksportafkast.

Highlights

- Danish bilateral aid has a positive impact on Danish exports
- The positive effect of bilateral aid on exports is a common finding in the literature
- The average export return is about 30 cent for each additional aid dollar, similar to a recent finding for the Netherlands.
- The overall average masks very large dispersions in the country specific returns.

Summary

Danish bilateral development assistance is aimed at reducing poverty in the partner countries. Even so, bilateral assistance may have secondary, or knock-on, effects, which are beneficial for Denmark. An important secondary effect is the prospect of increased export from Denmark to the partner countries. This Evaluation Study presents an econometric analysis of Danish exports to 144 countries over the period from 1981 to 2010. The analysis is based on the gravity model of bilateral trade; a structural model developed over decades and now the central model in analyses of bilateral trade flows and trade policies. The main result of the study is that Danish bilateral aid has a positive and statistically significant impact on Danish exports to the recipient countries.

Bilateral development assistance may affect exports through several channels. Three of the main channels are direct aid tying; increasing recipient income where higher income leads to higher imports, and decreased trade costs, say due to improved information about cultural and administrative customs and practices. Thus, as for preferential trade arrangements, bilateral aid has two potential economic effects; trade creation working through income and benefitting all countries, and trade diversion by increasing donor exports at the expense of other exporters. Both effects have been taken into account in recent econometric studies.

The Evaluation Study briefly summarizes the results of nine other econometric studies of bilateral aid and exports. Five of the studies estimate the impact of aid on bilateral trade for groups of donors, while the remaining four studies estimate the impact for a single donor county. The studies of groups of donors all include Denmark in the sample. The unanimity in the results regarding the links between bilateral assistance and donor exports is noteworthy. All nine studies find that bilateral aid has had a statistically significantly positive impact on exports to the recipient countries. The impact is not statistically significant for all periods in all models, as is also the case for Denmark, but the overall result is surprisingly well founded in the data spanning the past 30-50 years.

The parameter of interest in the econometric models estimates the percentage increase in exports following a percentage increase in aid to the specific country (the export/aid elasticity), or following a percentage point increase in aid relative to disposable GNI in the specific country (the export/aid semi-elasticity). This indicates that the estimated return in terms of dollars of increased exports per dollar of additional aid varies over time and across countries. The overall estimated average export return is about 30 cent per aid dollar when it is estimated using model formulations and methods that are directly comparable to the existing studies. The overall average masks a difference in returns of 5 cent per aid dollar for the Danish Priority Countries and 1.5 dollar per aid dollar for the group of countries in the Neighbourhood Programme. These results reflect that the impact of additional aid on exports will be higher if export is already high compared to the aid to a given country (aid/export ratio). Using an alternative specification where the percentage increase in exports following a one percentage point increase in the aid-to-GNI ratio is estimated, gives somewhat lower results – 8 cent increase in export pr. 1 dollar increase in aid to priority countries and 24 cent with regards to the Neighbourhood Programme countries.

The study also suggets that the impact of aid on exports was much higher in the 1980s compared to in particular the most recent decade. This may be related to factors such as untying of aid in the same period.

The econometric analysis has two important limitations. First of all, the model can only give information about marginal changes in aid. As a decision to give bilateral aid to a new country is not a marginal decision, the impact should not be evaluated based on the results presented in the study. Likewise, the impact on exports following a decision to stop all aid to a country cannot be deduced from the regression results. Thus, the results of this Evaluation Study are not useful as tools for country selection in the aid allocation decision. Second, although the export return is positive it is difficult to give a precise estimate of the size, both for individual countries and for country groups. The authors of this Evaluation Study clearly prefer a model formulation that indicates low overall average export returns (8 cent per dollar) and low returns for aid to the Neighbourhood Programme countries (24 cent per dollar) but the other model formulation cannot be excluded. Thus, model uncertainty leads to quite substantial uncertainty in the country specific export return.

1. Introduction

The overarching goal for Danish development cooperation is to fight the many faces of poverty, as stated in the Strategy for Denmark's Development Cooperation "The Right to a Better Life". Pursuing the overall goal does not preclude, however, that development cooperation may have positive externalities or feedback effects, which are beneficial for the Danish economy.

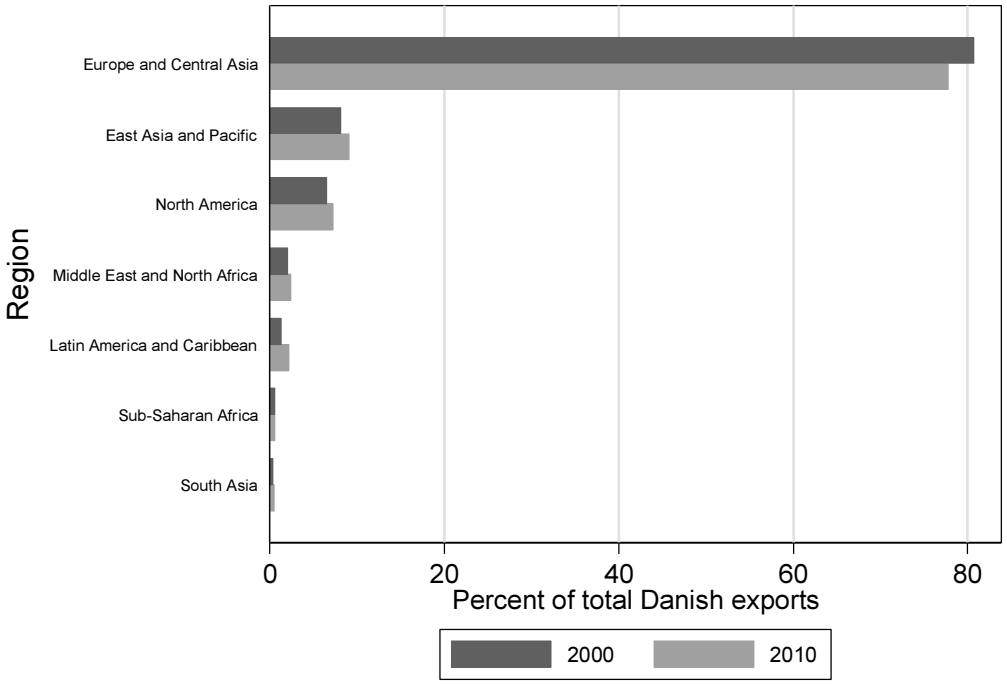
Some of the externalities were analyzed and quantified in the Dalberg Report published by the Ministry of Foreign Affairs in May 2013 (Dalberg, 2013). The report made a distinction between direct and knock-on effects of the Danish development cooperation and established that the direct effects, being mainly related to the governance and administration of the foreign aid, could be quantified reasonably well, while the secondary effects were much harder to identify precisely.

An important secondary effect is the prospect of increased trade between Denmark and the Danish partner countries. The export to the current Danish partner countries was described in the Dalberg Report but the report only refers to the factual, i.e., the actual export levels and market shares, while there was no counter-factual analysis aiming at quantifying the export that is generated by the Danish bilateral aid. For this reason, the Evaluation Department of the ministry of Foreign Affairs initiated the present Evaluation Study with the aim of quantifying the Danish export to the Danish partner countries that is derived, in the broad sense, from Danish bilateral aid.

Danish exports more than doubled in nominal terms, from USD 44 billion in 2000 to USD 91 billion in 2010 and it is of interest to establish if Danish aid has contributed to this increase. The distribution of Danish export by region of destination is shown in Figure 1 for the years 2000 and 2010. The Figure clearly illustrates how Danish exports are directed towards our European neighbours leaving only a small share to the more distant developing areas. Specifically, the figure demonstrates a constant share of exports to countries in Sub-Saharan Africa who, in total, buy less than 1% of total Danish exports.

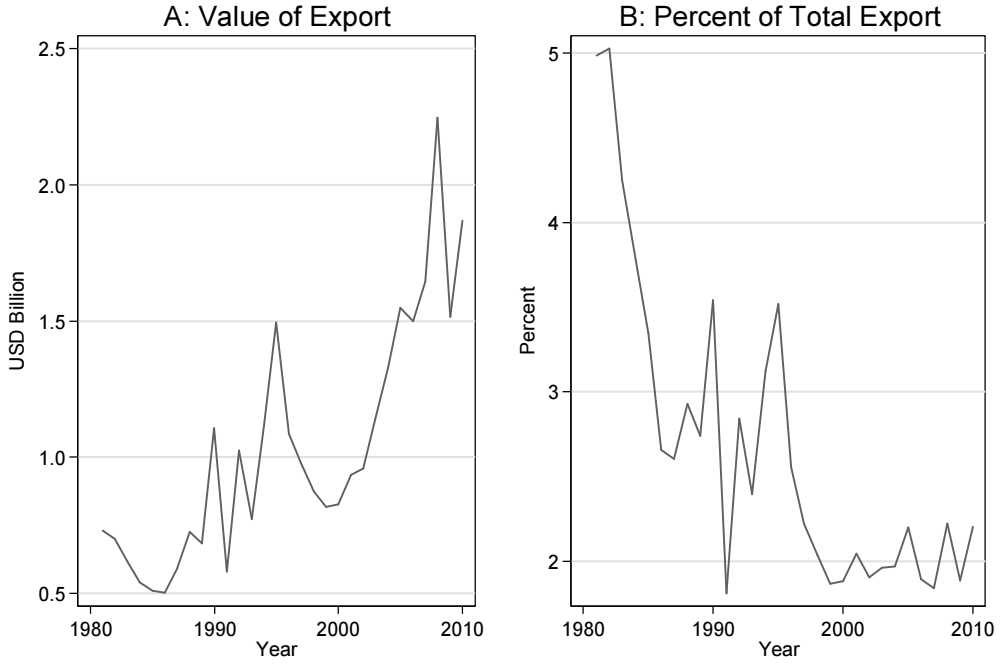
Using an income based classification of countries, Panel A in Figure 2 shows how the value of Danish exports to the 70 countries categorized as low- or lower-middle income countries by the World Bank has more than doubled in nominal terms, from USD ¾ billion in the early 1980s to about 2 billion in the mid-2000s. However, the increase in exports to this group of countries has been less than the increase in total exports and Panel B in Figure 2 illustrates how the share of exports to the low and lower-middle income countries has decreased, first dramatically in the early and mid-1980s from 5% to 3%, and subsequently down to around 2% from the mid-1990s and onwards.

Figure 1: Danish Export by Region of Destination 2000 and 2010



Source: UN COMTRADE (comtrade.un.org)

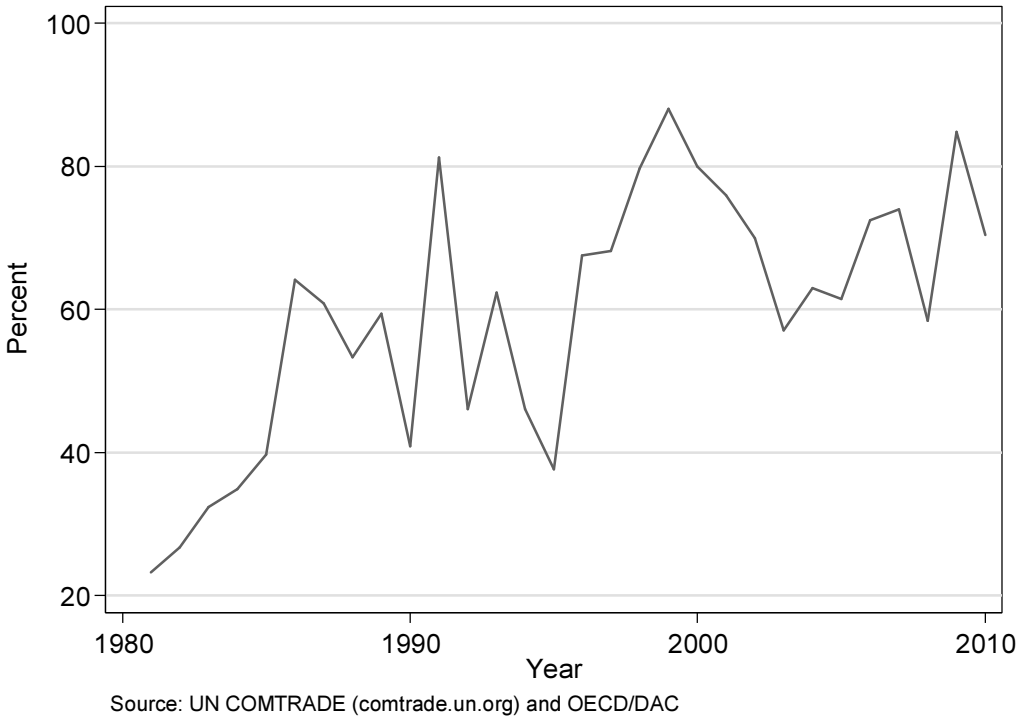
Figure 2: Danish Export to Low and Lower-Middle Income Countries



Source: UN COMTRADE (comtrade.un.org)

Hence, during the past 30 years Denmark has increased exports to the developing countries (in value terms) and at the same time we have also reduced our export to the developing countries (in relative terms).

Figure 3: Danish Bilateral Aid as a Percentage of Danish Exports to the 70 Low and Lower-Middle Income Countries



Source: UN COMTRADE (comtrade.un.org) and OECD/DAC

Danish bilateral aid to the low- and lower-middle income countries can be seen as having a similar pattern. Bilateral aid has increased considerably in nominal terms, but the development assistance is not growing with the speed of Danish exports. Still, the bilateral aid to the low and lower-middle income countries has increased more than Danish exports to the countries as illustrated in Figure 3, which shows how the bilateral aid increased from 30-40% of exports to these countries in the 1980s to 70-80% in the late 2000s. Thus, depending on exactly how exports and bilateral aid are described over time the past 30 years, different patterns and relationships can be highlighted. Therefore, an in-depth analysis of the contribution of Danish bilateral aid on Danish exports must be anchored in a soundly structured model of trade.

This Evaluation Study presents results of an econometric analysis of Danish exports to 144 countries over the period from 1981 to 2010, emphasizing the possible impact of development assistance from Denmark to our partner countries and other recipients. The econometric analysis is based on the

gravity model of bilateral trade, which has been developed over decades to become the central model in analyses of bilateral trade flows. We therefore briefly present the history of the gravity model in Section 2. This is followed by a discussion of the relation between aid an bilateral trade in Section 3 and a brief survey, in Section 4, of existing studies in which the impact of bilateral aid on exports is estimated using the gravity model. We give the precise formulation of the gravity model, as we use it for the analysis of the Danish export data, in Section 5 and present the empirical results in Section 6. We conclude the study with a brief discussion in Section 7.

2. The Gravity Model of Bilateral Trade Flows

The gravity model is a structural empirical model of World bilateral trade flows. The strengths of the model are that it is simple and intuitive, yet with a strong theoretical basis, and it has remarkably good explanatory power, both across countries and over time. The model has its name from the similarity with Newton's theory of gravitation, stating that the force of gravity (here trade) between two bodies (countries) is proportional to the mass of the attracting bodies (GDP) and inversely proportional to the square of their distance (trade costs).

The gravity specification has been used in empirical assessments of bilateral trade since Tinbergen (1962), but the theoretical underpinning is of more recent date. Anderson (1979) was the first to develop a theoretical model for the relation. Later, Deardorff (1998) derived a gravity-type relationship from the Heckscher-Ohlin model of trade based on factor endowments while Eaton and Kortum (2001) showed how the Ricardian model of trade from comparative advantage can also lead to a gravity equation. The latest and most complete formulations of theoretical models with gravity-style bilateral trade patterns were derived by Anderson and van Wincoop (2003) using the idea of monopolistic competition in differentiated products, and Helpman et al. (2004) who showed how the Melitz (2003) model of international trade in differentiated goods with heterogenous firms also leads to a gravity-type model. Thus, most major economic theories of international trade can be shown to lend support to the gravity model.

The main problem faced in empirical analyses of bilateral trade using the gravity model is that trade costs are almost impossible to observe directly because they, in addition to direct transportation cost, also cover information costs and contract enforcement costs in addition to other legal and regulatory costs and local distribution costs (see Anderson and van Wincoop, 2004). Econometric gravity models therefore capture trade costs by a range of indirect measures (proxy variables) such as physical distance,

direct adjacency (common borders) and common language, or other cultural and historical structures, for example colonial history. This means that empirical specifications, despite the theoretical underpinning, are largely *ad hoc* and driven by model purpose and fit rather than theoretical considerations. Some of the arbitrary inclusions and specifications of trade cost proxies are avoided when the models are estimated using panel data (time-series for several countries) because many of the proxy variables are time invariant, e.g., physical distance, common borders, common language and colonial history. These time invariant parts of the trade costs are captured by country specific indicators (dummies) in panel data regressions.[1]

One of the deep insights from the underlying theoretical model is the relative constancy of trade patterns despite decreases in trade costs induced by technological progress in transport and communication. While the decrease in transportation and communication costs is undisputable, the theoretical model by Andersen and van Wincoop (2003) illustrates how bilateral trade is affected by *relative* trade costs, but not absolute trade costs. Relative costs, between country pairs, may well be constant over time as all countries typically benefit from the progress in transport and communication technologies. This is an important insight supporting the use of panel data gravity regressions that apply a fixed effects specification.

3. Bilateral Aid and Bilateral Trade

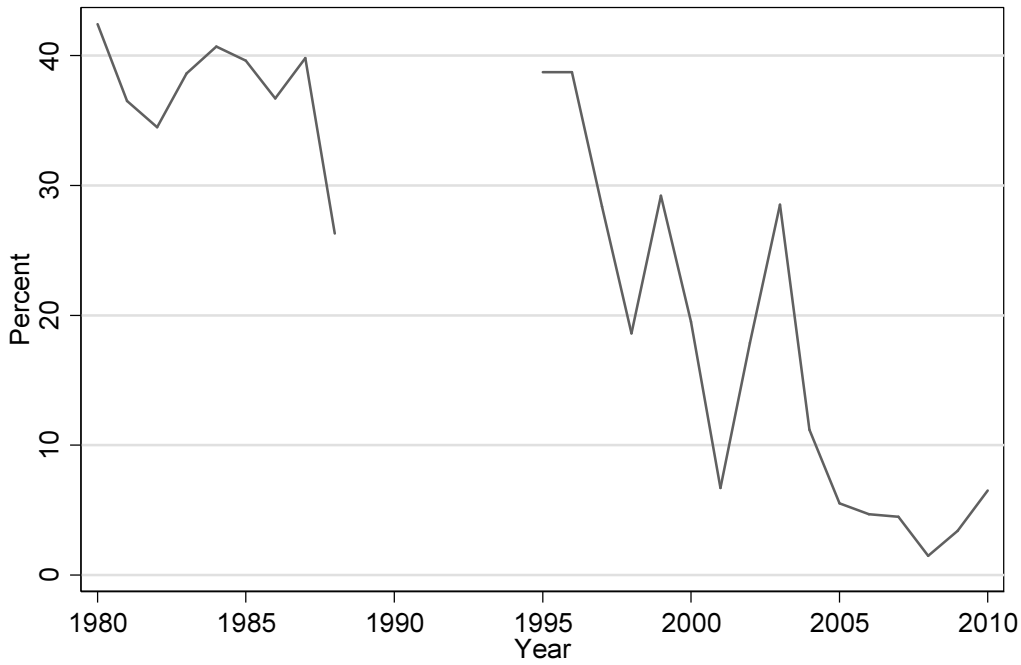
The relationship between cross-country transfers and trade has an even longer history than the gravity model, as the discussion of the transfer paradox between Keynes and Ohlin over the German reparations following World War I has been linked to aid transfers. In brief, an income transfer such as aid may improve or worsen the terms of trade of both the donor and the recipient. If the effect of the aid transfer on the terms of trade exceeds its direct income effect, the welfare of the donor may actually improve while the welfare of the recipient country worsens. This outcome is the transfer paradox. Samuelson showed that the transfer paradox cannot arise under free trade. However, the aid related transfer paradox literature has combined altruism with trade distortions to examine conditions under which the transfer paradox may arise. Brakman and van Marrewijk (2009) provide a survey of the literature. In the present context, the welfare aspects of aid transfers are not the focal point. Therefore, we do not look at terms-of-trade effects of the transfers.

[1] On the other hand, the country specific indicators do not "explain" the time invariant trade costs as they do not lead to economic interpretations. For this, the models still need the distance indicators.

The more recent literature on aid for trade (see e.g., McGillivray and Morrissey, 1998; Osei et al., 2004 and Calì and Velde, 2011) stresses three channels through which bilateral aid may lead to increasing exports from the donor to the recipients. The most obvious link is through formal aid tying where the provision of aid is either conditioned on or directly linked to purchasing of goods from companies in the donor country. Aid tying was quite common until the members of the DAC committee agreed to untie all aid to the Least Developed Countries in 2001 (to be effective from January 2002).

The share of tied aid in total Danish bilateral aid has decreased from about 40% in the 1980s to around 5% in 2005-2010 (see Figure 4). A less visible form of binding aid occurs when donors direct bilateral aid towards projects and programs in which their own industries have a competitive advantage. Regardless of the form, there appears to be a general agreement that aid tying should be and has been reduced, at least from the early 2000 onwards. This may have led to changes in the relationship between aid and exports over time. We look into this possibility in the export regressions presented in the empirical section.

Figure 4: The percentage share of tied aid in total Danish bilateral aid, 1980-2010



Note: Data for 1989-1994 are not available from the source.
Source: OECD iLibrary

The second direct channel from aid to donor exports is through the increase in recipient income (the direct transfer effect). The aid for trade papers mentioned above have lengthy discussions about the impact of aid on economic growth, as aid will only affect GDP in the long run if it increases the growth

rate. However, regardless of the impact of aid on a recipient country's economic growth, the transfer is increasing the disposable gross national income and the gravity model predicts increased trade (with all countries) as the income of a country increases. This general income effect may be enhanced if the marginal propensity to import is larger for aid projects and programs than for the general government budget or the economy as a whole. Clearly, if the income effect is the main link between aid and trade then all aid, irrespective of the origin, will lead to increased export from Denmark to the recipient countries.

The third channel is indirect but it can be captured by the gravity model. The idea is that bilateral aid may decrease the relative trade costs between the donor and recipient countries and thereby increase exports. If bilateral aid increases knowledge about, say, cultural and/or administrative customs or if it facilitates creation of cross-country business networks, then it may well lead to increased exports. This link is actually what is specified in several of the recent econometric studies of bilateral aid and trade that estimate the association using the gravity model. An interesting aspect of this link is that bilateral aid from Denmark would increase Danish exports at the cost of other donors and non-donor countries because the aid decreases the relative distance between Denmark and the partner country thereby increasing the relative trade costs between other exporters and that partner country.

Thus, as for preferential trade arrangements, bilateral aid has two economic effects; trade creation, working through income and benefitting all countries, and trade diversion, by increasing donor exports at the expense of other exporters. Both effects have been taken into account in recent econometric studies by inclusion of not only the bilateral aid from the individual donor country but also the aid flows from other donors. If the "trade cost" effect of aid is strong, the trade diversion effect from other donors' aid flow may be stronger than the income effect leading to an overall negative effect on Danish exports of other donors' aid.

4. Existing Empirical Findings and the Implications for Danish Aid

Econometric studies of the association between bilateral aid and donor exports using the gravity model began with Nilsson (1997) who analyzed aid and exports from the EU countries. Adhering to the custom for specifying trade cost proxies in the gravity model Nilsson included bilateral aid using the log-transformation, i.e., the logarithm of exports from the donor countries was regressed on the logarithm of bilateral aid and other variables. Consequently, the estimated parameter is an elasticity, measuring the predicted percentage change in exports to a country following a one percentage increase

in aid to the country. This specification is used in all subsequent studies of aid and bilateral trade whereby the empirical results are easily comparable across studies.

The gravity model encompasses modelling exports from either a single country or from a group of countries. Hence, one set of studies (Nilsson, 1997; Wagner, 2003; Johansson and Petterson, 2009; Silva and Nelson, 2012; and Petterson and Johansson, 2013) estimate the impact of aid on bilateral trade for groups of donors, while another set (Zarin-Nejadan et al., 2008; Martinez-Zarzoso et al., 2009; Novwak-Lehmann et al, 2009 and Martinez-Zarzoso et al., undated) estimate the impact for a single donor county. The studies of groups of donors all include Denmark in the sample. Furthermore, all studies have observations over time and across countries, i.e., panel data, but not all studies use country fixed effects in the regressions.

The impact of bilateral aid on trade as estimated by the export/aid elasticity is reported in the first column of Table 2. The first five studies estimate a common elasticity for a group of donors, while the last four studies estimate the elasticity for individual donor countries. The individual country analyses are for Switzerland, Germany (two studies) and the Netherlands, respectively.[2] The second column of Table 2 gives 95% confidence intervals for the estimated elasticities to ease comparison of the size of the estimated elasticities across studies.

All studies report statistically significant, positive elasticities, implying that increased aid flows are associated with increased exports. The range of point estimates is quite wide, from 0.204 in Nilsson (1979) to 0.028 in Silva and Nelson (2012), but apart from the two extremes the estimated elasticities are not too different, considering the sampling uncertainty. Still, the estimated elasticities for Switzerland (Zarin-Nejadan et al., 2008) and the Netherlands (Martinez-Zarzoso et al., undated) are somewhat lower than most of the country group estimates, and in particular compared to the estimates for Germany.

In the debates about bilateral aid and exports the predicted percentage increase in exports following a one percent increase in aid (the elasticity) is not the variable of interest. Instead, interest centers on the predicted return in terms of the dollar value of increased exports to an additional aid dollar allocated to a partner country. The predicted return is estimated by multiplying the estimated elasticity (reported in

[2] The two studies on Germany are by a common author group. The two studies use very different estimators. One uses advanced panel data estimators while the other uses advanced time series estimators. The close similarity of the estimated elasticities is interesting form a methodological point of view.

the first column) by the ratio of export to aid. Thus, the return, in terms of increased amounts of exports, varies over time and across countries.

Based on an estimated elasticity of 0.11 and a ratio of average export to average aid of 12.56, Martìnez-Zarzoso et al (2009) estimate the average predicted return for Germany to be 1.4 dollar of increased exports for a one dollar increase in aid, while Martìnez-Zarzoso et al. (undated) estimate a return of 0.286 dollar for the Netherlands by multiplying the elasticity of 0.035 by an export-aid ratio of 8.41. The corresponding ratio of export to aid is 4.06 for Denmark. This ratio is computed as average exports from 1981 to 2010 to all contries receving bilateral aid from Denmark divided by the average bilateral aid given to these countries over the same years.

Table 1: Estimated export/aid elasticities in gravity models of bilateral trade

Study	Estimated Elasticity	95% Confidence Interval	Average effect of a 1 dollar increase in aid for		
			Denmark	The Netherlands	Germany
1. Nilsson (1997)	0.204	*	0.828	1.716	2.562
2. Wagner (2003)	0.062	0.038 - 0.086	0.252	0.521	0.779
3. Johansson and Petterson (2009)	0.105	0.080 - 0.130	0.426	0.883	1.319
4. Silva and Nelson (2012)	0.028	*	0.114	0.235	0.352
5 Petterson and Johansson (2013)	0.091	0.080 – 0.102	0.369	0.765	1.143
6. Zarin-Nejadan et al. (2008)	0.045	0.018 - 0.072	0.183	0.378	0.565
7. Martinez-Zarzoso et al. (2009)	0.110	0.061 - 0.115	0.447	0.925	1.382
8. Novwak-Lehmann et al (2009)	0.090	0.010 - 0.170	0.365	0.757	1.130
9 Martinez-Zarzoso et al. (undated)	0.034	0.017 - 0.053	0.138	0.286	0.427

* The study reports *p*-values instead of standard errors or *t*-statistics and the *p*-values are not reported with a precision useful for calculation of confidence intervals.

Note: The ratios of average export to average aid are 4.06 for Denmark, 8.41 for the Netherlands and 12.56 for Germany.

1. Eleven donors, including Denmark, The Netherlands and Germany (Results from Silva and Nelson. 2012. Table 1. col 2)
2. Twenty donors. including Denmark, The Netherlands and Germany (Table 3. col 2)
3. Denmark, Finland, Ireland, The Netherlands, Norway, Sweden and United Kingdom
4. All high income countries using the WB 2005 classification. (Table 1. col 10)
5. All DAC donors (Table 1, col 4)
6. Switzerland (1966-2003) (Table 6.1. row 5)
7. Germany (Table 1. col. 3, long run aid coefficient)
8. Germany (Table 5)
9. The Netherlands 1999-2009 (Table 2. col 1)

Using the three estimates of the ratio of exports to aid we compute estimated export returns for Denmark, the Netherlands and Germany based on the estimated elasticities in the nine studies. The estimated returns are reported in Table 1. In these comparisons it should be noted that the elasticities estimated in the first three studies include the three countries in the sample of donor countries. Thus the comparison makes sense from the perspective of reporting derived, country specific, statistics based

on the regression results. It is no surprise that the estimated export return for Denmark is lower than the returns for both the Netherlands and for Germany when these are compared row wise. The row wise variation is completely determined by the ratio of the Dutch and German export-to-aid ratios relative to the Danish export-to-aid ratio, and the data shows that these ratios are 2/1 for the Netherlands and 3/1 for Germany such that the Dutch elasticity is always twice the Danish while the German is three times the Danish for constant export/aid elasticities. Consequently, the interesting comparisons are also across rows in Table 1 as they illustrate the economic magnitude of the uncertainty in the estimated returns. The average Danish export return is always below one dollar, while the German is often above. Furthermore, the average Danish return may be as low as 10 cents per aid dollar, if the elasticity from Silva and Nelson (2012) is used to compute the return.

Table 2: Estimated export/aid elasticities in gravity models of bilateral trade

Study	Estimated	Effect of a 1 dollar increase in aid on export to			
	Elasticity	Tanzania	Vietnam	Belarus	China
1. Nilsson (1997)	0.204	0.020	0.326	5.30	585
2. Wagner (2003)	0.062	0.006	0.099	1.61	178
3. Johansson and Petterson (2009)	0.105	0.011	0.168	1.17	129
4. Silva and Nelson (2012)	0.028	0.003	0.045	2.73	301
5 Petterson and Johansson (2013)	0.091	0.009	0.146	2.37	261
6. Zarin-Nejadan et al. (2008)	0.045	0.005	0.072	2.29	253
7. Martinez-Zarzoso et al. (2009)	0.088	0.009	0.141	2.34	258
8. Novwak-Lehmann et al (2009)	0.090	0.009	0.144	0.91	100
9 Martinez-Zarzoso et al. (undated)	0.035	0.004	0.056	0.73	80

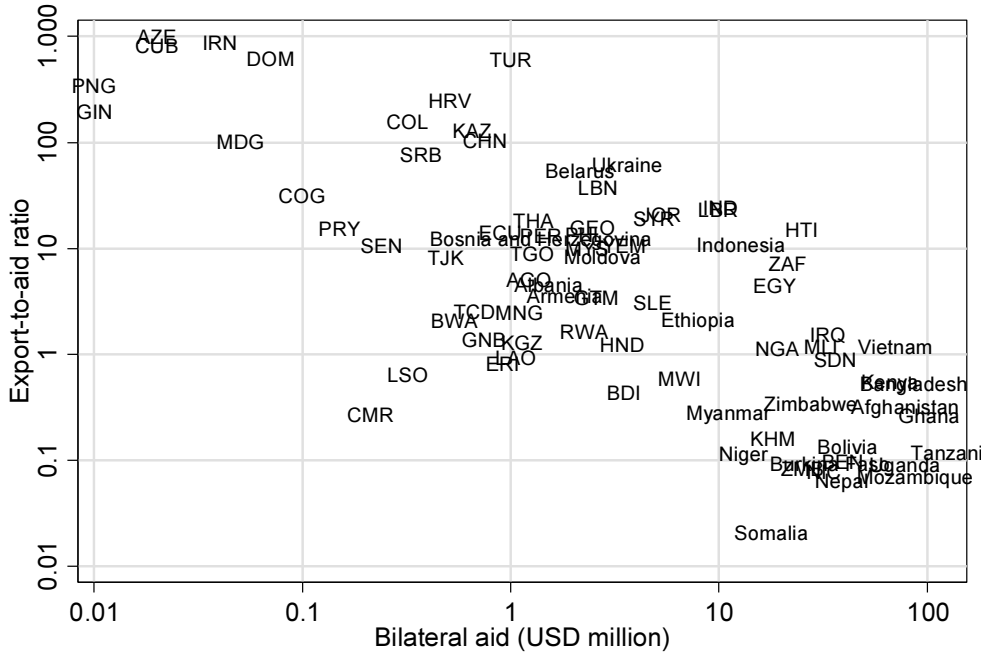
Note: See Table 1 and the text for explanations. The ratios of export to aid are 0.1 for Tanzania, 1.6 for Vietnam, 26 for Belarus and 2870 for China.

In addition to the variation given from the differences in the estimated elasticities there is an additional variation in export returns from the variability in the ratios of export to aid across recipient countries and over time. To illustrate the latter variability we report, in Table 2, estimated returns to an increase of one dollar of aid given to Tanzania, Vietnam, Belarus and China in 2010. The figures in the Table are obtained by multiplying the estimated elasticities in column 1 and the export-to-aid ratio for each of the four countries, respectively. In 2010 the ratio was 0.1 for Tanzania, 1.6 for Vietnam, 26 for Belarus and 2870 for China. As seen the export return on aid to the Neighbourhood programme country Belarus is 260 times larger than the return on aid to the priority country Tanzania. Clearly, the difference in export-to-aid ratios across the recipients of Danish bilateral aid dwarfs the variation in the estimated elasticities across the nine studies. Regardless of the estimated elasticity the added export to Tanzania is never of economic interest, being at most one cent per dollar, and it is not too large for Vietnam. In contrast, the increase in exports is typically above 1 dollar for Belarus and excessive (hundreds of dollar) for China. This illustrates a weakness in comparing average export returns across countries as

done in Martìnez-Zarzoso et al (2009). Average export returns can change dramatically if there are small changes in the sets of bilateral aid recipiants.

The latter issue is underlined by noting that the four countries in Table 2 are not the extremes in the distribution of export-to-aid ratios across Danish aid recipients. Figure 5 plots the ratios, given as the median ratio between 2001 and 2010 for each country against the bilateral aid to the country in 2010. The observations are indicated by full country names for the Danish priority countries and the countries in the Neighbourhood programme while all other countries receiving bilateral aid in 2010 are indicated by the World Bank ISO-code.[3]

Figure 5: Danish bilateral aid in 2010 and the export-to-aid ratio



Note: The export-to-aid ratio is the median ratio in the 2000s for each country.
Countries with negative aid flows are excluded.

Most of the Danish priority countries received more than USD 10 million in 2010 and they have export-to-aid ratios between 0.05 and 2 indicating that exports, in value terms, are not very responsive to changes in aid (Indonesia being an exception). The countries in the Neighbourhood programme typically received just above USD 1 million in 2010 and they have export-to-aid ratios between 3 and

[3] The Danish priority countries, as of January 2014, are Afghanistan, Bangladesh, Bhutan, Bolivia, Burkina Faso, Burma (listed as Myanmar), Ethiopia, Ghana, Indonesia, Kenya, Mozambique, Nepal, Niger, Pakistan, Palestine, Somalia, South Sudan, Tanzania, Uganda, Vietnam, Zimbabwe. We do not have Bhutan, Palestine and South Sudan in the sample. The Danish Neighbourhood programme includes seven countries: Albania, Armenia, Belarus, Bosnia and Herzegovina, Kosovo and Moldova and Ukraine. We do not have Kosovo in the sample.

60, with an average ratio of 18. Finally, Denmark allocates small amounts of aid to a few countries and these have huge export-to-aid ratios such that exports to these countries are perceived to respond strongly in value terms to small changes in the aid flows.

In sum, the nine econometric studies show that the aid to export link is positive and statistically significant for the DAC donors as a group and also for central donor countries, when analyzed individually. Hence, in all likelihood, increased bilateral aid leads to increased export from the donor to the recipient country. But the specification of the impact of aid on exports in the gravity equation does not look sensible in terms of the estimated average partial effect across recipient countries. Therefore, in the subsequent sections, we estimate the gravity equation for Danish export both by the specification used in the existing studies and by an alternative specification, which we find to be more reasonable. We give the explicit formulations of the gravity models in the next section.

5. Empirical Strategy

The gravity equation, focusing on export from a single country (Denmark) to several countries over several years, can be formulated as

$$\begin{aligned}\log(export_{it}) &= \beta_0 + \beta_1 \log(GDP_{it}) + \beta_2 \log(Population_{it}) + \beta_3 \log(GDP_t^{DK}) + \beta_4 \log(Population_t^{DK}) \\ &+ f(TradeCost_{it}) + \varepsilon_{it} \quad i = 1,\ldots,N, t = 1,\ldots,T\end{aligned} \tag{1}$$

where subscript *i* indexes the export destination countries and *t* indexes time (years). The dependent variable is Danish export, in principle to all countries in the World. The four explanatory variables, spelled out in equation (1), are the gross domestic products in the destination country (*GDP*) and in Denmark (GDP^{DK}) and the populations in the countries (*Population* and $Population^{DK}$). The theoretical models restrict the coefficients on both GDP measures to be 1, to enforce proportionality. This is typically not done in less strict gravity regressions, such as the export/aid regressions presented in the previous section. The inclusion of the country size in terms of populations is to take account of the stylized fact that larger countries have relatively less international trade because there are more options for trade domestically. Thus the expected partial effects of the populations on export are negative.

Since we have panel data we use country dummies (α_i) to capture trade costs. Consequently, the trade costs are specified as

$$f(TradeCosts_{it}) = \alpha_i + \gamma_1 \log(\max(DanishAid_{it},1)) + \gamma_2 \log(\max(OtherBilateralAid_{it},1)) \\ +\gamma_3 \log(\max(MultAid_{it},1)) + \delta_1 \mathbf{1}(NoDanishAid_{it}) + \delta_2 \mathbf{1}(NoOtherBilateralAid_{it}) + \delta_3 \mathbf{1}(NoMultAid_{it}). \quad (2)$$

In addition to the country dummies, we include three aid variables: Danish bilateral aid (*DanishAid*), bilateral aid from the other DAC donors (*OtherBilateralAid*) and multilateral aid (*MultAid*). The inclusion of the bilateral aid from other donors is to take account of the trade creation and trade diversion effects of other bilateral donors' flows to the Danish trading partners. Likewise, multilateral aid increases the disposable gross national income in the recipient countries, which should generate increased trade with all countries, including Denmark. The sign and magnitude of the two latter aid variables is difficult to ascertain *a priori*.

Following the literature we log-transform all three aid variables, and this leads to the somewhat awkward formulation of the model as the three aid flows are zero for many countries (far from all Danish trading partners receive aid) and some aid flows are negative (when recipient countries pay back aid loans). To take account of this we take the log of the maximum of the aid flow or 1, such that the resulting variable is the log of aid when the flow is positive or 0 when the flow is zero or negative. At the same time we record when the aid flows are zero or negative using the three indicator variables (dummies) given in the second line of equation (2). The parameters for the three dummies (δ_1, δ_2 and δ_3) provide estimates of the relative difference in export levels when a recipient country switches form no aid to a small amount of aid (and vice versa, when a country switches from receiving a small amount of aid to no aid). The purpose of the dummies is to ensure unbiased estimates of the export/aid elasticities, the estimated parameters are of no independent interest.

In the base regressions we include time-dummies (λ_t) to capture common changes in Danish export patterns. When these dummies are included in the regression, the partial effects of Danish GDP and population are no longer identifiable, as these variables do not vary across countries. Therefore our basic regression specification becomes

$$\log(export_{it}) = \beta_1 \log(GDP_{it}) + \beta_2 \log(Population_{it}) + \gamma_1 \log(\max(DanishAid_{it},1)) \\ +\gamma_2 \log(\max(OtherBilateralAid_{it},1)) + \gamma_3 \log(\max(MultAid_{it},1)) \\ +\delta_1 \mathbf{1}(NoDanishAid_{it}) + \delta_2 \mathbf{1}(NoOtherBilateralAid_{it}) + \delta_3 \mathbf{1}(NoMultAid_{it}) \\ +\alpha_i + \lambda_t + \varepsilon_{it} \quad i = 1,\ldots,N, t = 1,\ldots,T \quad (3)$$

For comparison with the earlier studies we also formulate the model with at time trend instead of time dummies, such that the parameters upon the measures for Denmark can be identified and estimated:

$$\begin{aligned}
&\log(export_{it}) = \beta_1 \log(GDP_{it}) + \beta_2 \log(Population_{it}) + \beta_3 \log(GDP_t^{DK}) + \beta_4 \log(Population_t^{DK}) \\
&+\gamma_1 \log(\max(DanishAid_{it},1)) + \gamma_2 \log(\max(OtherBilateralAid_{it},1)) + \gamma_3 \log(\max(MultAid_{it},1)) \\
&+\delta_1 \mathbf{1}(NoDanishAid_{it}) + \delta_2 \mathbf{1}(NoOtherBilateralAid_{it}) + \delta_3 \mathbf{1}(NoMultAid_{it}) + \lambda trend \\
&+\alpha_i + \varepsilon_{it} \quad i = 1,\ldots,N, t = 1,\ldots,T
\end{aligned} \tag{4}$$

In both formulations the impact of Danish bilateral aid on exports is estimated as a constant elasticity, γ_1, while the dollar-for-dollar return varies over countries and time.

Turning to the alternative specification we start from the income generating effect of aid. The theoretical models of trade do not include foreign ownership of production factors or governments. Therefore, there are no cross country factor payments or government-to-government transfers between countries. This means that disposable GNI equals GNI, which in turn equals the value of production, GDP. We incorporate the effect of factor payments to foreigners and government transfers by computing a disposable income measure:

$$\begin{aligned}
dispGNI_{it} &= GNI_{it} + OtherBilateralAid_{it} + MultAid_{it} + DanishAid_{it} \equiv GNI_{it}^{+} + DanishAid_{it} \\
&= GNI_{it}^{+}(1 + DanishAid_{it} / GNI_{it}^{+}).
\end{aligned} \tag{5}$$

Replacing the importer country GDP by the disposable GNI in equation (3) we may write the gravity equation with aid as

$$\log(export_{it}) = \beta_1 \log(GNI_{it}^{+}) + \beta_2 \log(Population_{it}) + \theta_1 \log(1 + DanishAid_{it} / GNI_{it}^{+}) + \alpha_i + \lambda_t + \varepsilon_{it} \tag{6}$$

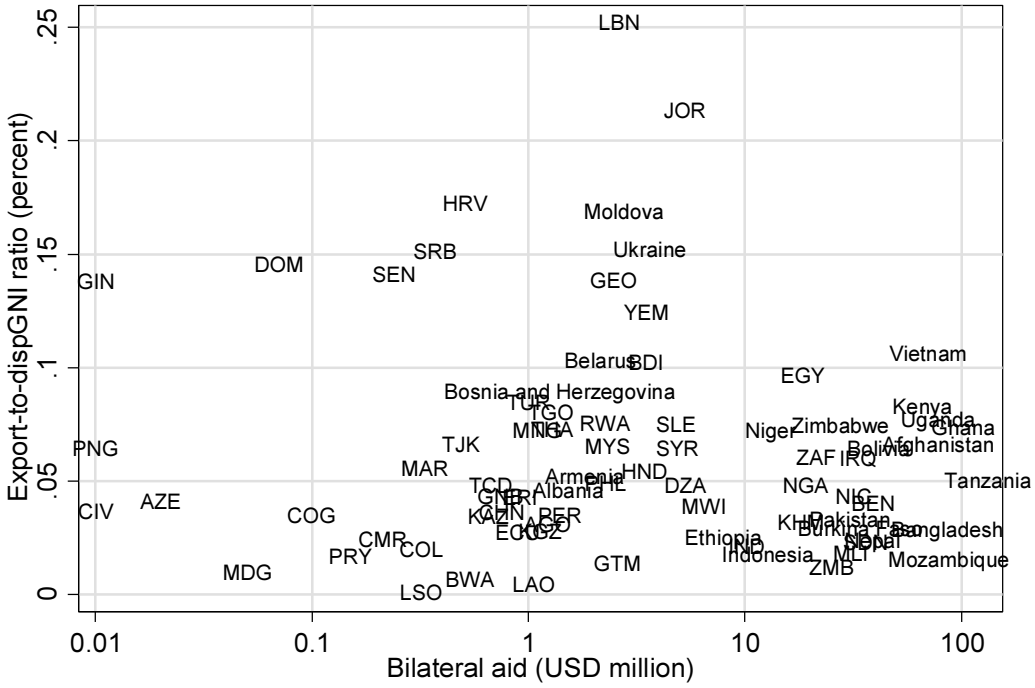
In this model it can be tested if bilateral aid is only income enhancing ($\beta_1 = \theta_1$) or if it has a larger effect on exports ($\beta_1 < \theta_1$). Further, other aid flows have a positive income effect through GNI^{+} and a negative trade diversion effect through the term $DanishAid/GNI^{+}$.

The formulation in (6) encompasses both zero and negative aid flows, so there is no need for arbitrary transformations or indicator variables. We consider this to be a strong argument in favor of the formulation. A second argument can be seen from the computation of the dollar-for-dollar return to bilateral aid flows in terms of export. Based on the parameterization in equation (6), the return is computed as

$$\frac{\partial exports_{it}}{\partial DanishAid_{it}} = \theta_1 \frac{exports_{it}}{dispGNI_{it}} \tag{7}$$

As seen the return is the product of the export/aid elasticity and the export-to-dispGNI ratio. The latter ratio is central in the gravity model and it is well defined for all countries, regardless of their status as aid donors or aid recipients. Therefore, one can, in principle, compute predicted returns for countries that are not presently recipients of Danish aid.

Figure 6: Danish bilateral aid in 2010 and the export-to-dispGNI ratio



Note: Countries with negative aid flows are excluded.

In Figure 6 we plot the export-to-dispGNI ratio (in percent) against the bilateral aid flows in 2010 for comparison with the export-to-aid ratio in Figure 5. The altered size dependence is clearly visible from the plots. Thus, in addition to the two theoretical arguments in favor of the alternative formulation, it may also empirically be a better basis for estimating average export returns.

6. Results for Danish Bilateral Aid

6.1 The Data

We combine export data from UN COMTRADE with data for GDP, GNI and populations from World Development Indicators and aid data from OECD/DAC. The specific sources are given in Appendix 1. COMTRADE has trade data for almost 200 countries or areas from 1962 onwards. We

exclude countries with less than one million people because trade with very small states is often highly specialized and somewhat atypical. Further, we only analyze the annual data from 1981 to 2010 (the latest year available). Thereby, the econometric analysis covers 144 countries over 30 years. This yields a potential sample of 4,320 observations, but missing observations on GDP, GNI, aid or exports leaves us with 3,824 observations.[4] There are many country/years for which Denmark has no export. Treating these zero flows as missing observations (as we do) leads to a sample selection problem. This problem, which is common in bilateral trade regressions, has been studied intensely in recent years and it is generally found that the sample selection, while statistically significant, has little economic impact. (See e.g., Helpman et al., 2004).

6.2 Basic results for the standard formulation

In Table3 we report the basic regression results for Danish exports and bilateral aid. The Table has six regressions. In Regressions (1)-(3) the model includes both country and time dummies as specified in equation (3), while, in Regressions (4)-(6), the model includes Danish GDP and population and a time trend, but no time dummies as specified in equation (4). The two formulations are shown side-by-side to illustrate that the estimated parameters do not change much by the change in model formulation.

Regressions (1) and (4) are standard, static fixed effect regressions while Regressions (2) and (5) include the one year lagged value of exports as an explanatory variable to capture dynamics. Dynamic fixed effects regressions are biased when the number of time series observations (here years) is small, therefore, we report results of generalized method of moments (GMM) regressions in Regressions (3) and (6).[5] We have specified the GMM regressions such that both exports and Danish bilateral aid are included as endogenous variables. Significant differences between the estimated parameters in the FE regression (2) and the GMM regression (3) is therefore both a check of the dynamic FE-bias and a check of possible endogeneity of the Danish aid flows.[6] This is also the case for Regressions (5) and (6). As seen from the Table, the estimated parameters in the two pairs of dynamic FE and GMM regressions do not differ by much.

Table3 also shows that the parameter estimates are relatively insensitive to the regression formulation in terms inclusion or exclusion of the time dummies. As the estimated standard errors are small using

[4] We have not looked into systematic variation in the missing observations although it is obvious that relatively more observations are missing for low income countries than for high income countries.
[5] We use the Blundell-Bond dynamic panel data estimator (Blundell and Bond, 1998).
[6] Part of the possible endogeneity of the Danish bilateral aid allocations is accounted for by the fixed effects transformation. The comparison of the FE and GMM results, therefore, does not test endogeneity of the aid flows as such.

both formulations we favor the models with time dummies (Regressions (1)-(3)) as this is the most robust regression formulation.

Both the GDP variables and the population variables enter with the expected signs, and the magnitude of the impact of the destination country GDP is reasonably high. In the GMM regressions we cannot reject the hypothesis that the long run coefficient (the estimated parameter divided by one minus the parameter upon lagged export) is unity as prescribed by the theoretical models.

Table 3: Aid in the Gravity Regression for Danish Export

Regression	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	GMM	FE	FE	GMM
GDP	0.559***	0.308***	0.586***	0.482***	0.273***	0.504***
	(0.089)	(0.058)	(0.141)	(0.089)	(0.056)	(0.118)
Population	-1.267***	-0.592***	-0.279***	-1.232***	-0.582***	-0.158*
	(0.350)	(0.198)	(0.079)	(0.342)	(0.194)	(0.087)
GDP DK				0.266**	0.240***	0.238**
				(0.104)	(0.067)	(0.098)
Population DK				-6.812*	-4.543**	-6.346***
				(3.450)	(1.988)	(2.148)
Danish Aid	0.059***	0.041***	0.046***	0.059***	0.039***	0.035**
	(0.018)	(0.012)	(0.015)	(0.018)	(0.012)	(0.015)
Other Bilateral Aid	0.015	-0.001	0.013	-0.000	-0.007	-0.015
	(0.037)	(0.021)	(0.028)	(0.038)	(0.022)	(0.026)
Multilateral Aid	0.041	0.015	-0.004	0.039	0.013	-0.016
	(0.026)	(0.015)	(0.020)	(0.026)	(0.015)	(0.019)
Trend				0.050***	0.021**	0.010
				(0.014)	(0.008)	(0.008)
Export, lagged		0.480***	0.393***		0.474***	0.385***
		(0.048)	(0.054)		(0.048)	(0.052)
Long run aid elasticity		0.078***	0.075***		0.075***	0.057***
		(0.021)	(0.025)		(0.022)	(0.024)
Observations	3,824	3,798	3,798	3,824	3,798	3,798

Note: The sample is 144 countries over the period 1981-2010. The average number of years for which we have country observations is 26.38. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. Regressions (1)-(3) include time dummies. The full table of estimated parameters is given in Appendix Table 1.

The long run elasticity of Danish aid is reported in the bottom part of the Table for the four dynamic regressions. The estimated elasticity is about 0.075 in the dynamic models while it is slightly lower in the static regressions (0.059) as expected. The point estimates of the elasticity are statistically significant at conventional levels of significance in all six regressions and the order of magnitude is in good accordance with the parameter estimates in the studies reported in Table 2. If anything, the estimated elasticity appears to be in the high end of the distribution, closer to Germany than the Netherlands.

For the bilateral aid from other donors and the multilateral aid we do not find significant effects on Danish export. This may be a result of positive and negative effects of almost equal order of magnitude that cancel each other out rather than "no effects at all".

6.3 Parameter Constancy

The estimated export/aid elasticity may vary with observable characteristics of the recipient countries, for example by geographical placement or income level and the parameter may vary over time. We look into some of these alternatives in this section. In Appendix-Table 2, we test if the elasticity varies systematically across regions. This hypothesis appears reasonable as a simple way of interacting aid and physical distance. For example, aid could have a larger trade effect in more distant countries because aid may decrease a relatively substantial cultural and administrative information gap. We test the hypothesis by including interaction terms between the Danish aid variable and the regions. In this way we directly get individual statistical tests of differences between the base region and the regions for which we include the interactions. We use Sub-Saharan Africa as the baseline group and thus test if there is a significant difference between the elasticity for Sub-Saharan African countries and the elasticities for the other regions. As for the baseline models we report results from three different estimators: the static fixed effects, the dynamic fixed effects and the dynamic GMM regression. All three regressions include time dummies. The two fixed effects regressions show insignificant differences between the geographical regions, both in the individual tests and the joint test. The GMM regression, on the other hand shows that the elasticity may be lower for aid recipients in Latin America and the Caribbean. In terms of the economic order of magnitude, an example is exports to Bolivia. The Danish export-to-aid ratio for Bolivia was 0.3 in 2010. Using the overall GMM estimate of the elasticity of 0.075 we find that a dollar change in aid to Bolivia will have a long run effect of 2.25 cent. Using the estimate from Regression (3) in Appendix-Table 2 the return is halved to 1.36 cent per aid dollar. While statistically significant, none of these figures are economically substantial.

We also test if the elasticity varies with income group as defined by the World Bank in 2013. Specifically, in Appendix-Table 3, Regressions (1) to (3), we include an interaction between Danish aid and an indicator for low income countries, while we use an indicator for low income and lower-middle income countries in Regressions (4) to (6). The static fixed effects regression gives a marginally significant lower elasticity for the low income countries, but the result does not carry over to the dynamic models. We conclude that the elasticity does not vary, in a simple way, with recipient country income. Of course, this does not imply that Danish exports do not respond to recipient country income. This effect is directly included in the gravity model through the recipient country GDP.

In Appendix-Table 4 we test if the presence of a Danish embassy or other forms of representation in a country alters the aid elasticity. The Table shows that Danish representations do not significantly change the elasticity. This does not, however, imply that Danish representations have no impact on exports as such. We cannot identify and estimate the individual impact of Danish representations on exports because the direct effect is removed by the inclusion of the country specific effects. Thus, we can only conclude that Danish representations do not appear to change the export/aid elasticity.

The final specification test is whether the elasticity has changed over time. In Appendix-Table 5 we include interactions by decade. The regressions show a decreasing elasticity over time, which is marginally significant in the 1990s in two of the regressions and highly significant in the 2000s for all three regressions. Thus, there are strong indications of a decreasing elasticity over time. To get a more complete picture of the changes we estimate all model parameters by decade. The results are given in Table 4: Regressions (1)-(3) are for the 1980s, while Regressions (4)-(6) cover the 1990s and Regressions (7)-(9) are for the 2000s. The decreasing elasticity is clearly visible from the point estimates. Moreover, the elasticity becomes statistically insignificant in the 2000s, such that aid has no impact on Danish exports in the 2000s. This result contrasts Martinez-Zarzoso et al. (undated) who find an increasing elasticity for the Netherlands.

Table 4: The Gravity Regression by Decade

	1981 – 1990 (115 countries)			1991 – 2000 (137 countries)			2001 – 2010 (143 countries)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FE	FE	GMM	FE	FE	GMM	FE	FE	GMM
GDP	0.302*	0.214*	0.700***	0.225	0.272**	0.475*	0.322***	0.270***	0.610***
	(0.155)	(0.118)	(0.127)	(0.139)	(0.127)	(0.278)	(0.107)	(0.088)	(0.083)
Population	-1.611**	-1.265**	-0.407***	-1.858***	-1.356**	-0.140	-1.575*	-1.302*	-0.071
	(0.629)	(0.488)	(0.149)	(0.654)	(0.682)	(0.208)	(0.824)	(0.705)	(0.132)
Danish Aid	0.079***	0.066**	0.063**	0.074***	0.063***	0.032	0.031	0.029	0.023
	(0.030)	(0.025)	(0.031)	(0.018)	(0.021)	(0.024)	(0.022)	(0.020)	(0.017)
Other Bilateral Aid	0.001	0.010	0.077	0.159**	0.081*	-0.059	-0.028	-0.028	-0.003
	(0.049)	(0.040)	(0.055)	(0.065)	(0.045)	(0.086)	(0.042)	(0.036)	(0.036)
Multilateral Aid	0.074*	0.053	-0.029	0.068**	0.020	0.026	0.013	0.016	-0.009
	(0.042)	(0.033)	(0.044)	(0.032)	(0.025)	(0.026)	(0.027)	(0.023)	(0.033)
Export, lagged		0.316***	0.493***		0.135*	0.321***		0.195**	0.298***
		(0.046)	(0.065)		(0.075)	(0.089)		(0.087)	(0.104)
Long run aid elasticity		0.096***	0.124**		0.073***	0.047		0.036	0.033
		(0.036)	(0.059)		(0.021)	(0.037)		(0.025)	(0.024)
Observations	1,079	1,079	1,079	1,329	1,304	1,304	1,416	1,415	1,415

Note: Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. All regressions include "no-aid" dummies and time dummies

6.4 Results for the Alternative Specification of Aid in the Gravity Model

Turning to the alternative specification of aid in the gravity model, we estimate and test the regression model in the same way as the specification reported above. That is, we estimate a static fixed effects model, a dynamic fixed effects model and a dynamic model in which aid is treated as an endogenous regressor. Table 5 presents the basic results for the alternative specification.

The first thing to note is that using GNI^{+} instead of GDP increases the elasticity of destination country income in all regressions, and the long-run elasticity is close to unity in the dynamic models. Second, the parameters are also well determined and reasonably constant across estimators and specifications of time dummies or time trend. Third, the impact of Danish aid on exports is also highly significant in this specification. The parameter estimats the percentage increase in exports following a one percentage point increase in the aid-to-GNI ratio. Thus the effect is a semi-elasticity. As seen, a one percentage point increase in the aid-to-GNI ratio appears to lead to roughly a 1 to 1.5 percent increase in exports to the recipient country in the long run.

Table 5: The Alternative Specification of Aid in the Gravtiy Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	GMM	FE	FE	GMM
GNI^{+}	0.681***	0.379***	0.750***	0.609***	0.345***	0.689***
	(0.103)	(0.063)	(0.084)	(0.101)	(0.060)	(0.077)
Population	-1.177***	-0.560***	-0.425**	-1.157***	-0.562***	-0.333**
	(0.291)	(0.166)	(0.172)	(0.287)	(0.164)	(0.163)
GDP DK				0.220*	0.210***	0.048
				(0.118)	(0.071)	(0.076)
Population DK				-6.851*	-4.996**	-9.034***
				(3.499)	(2.023)	(2.396)
Danish Aid	0.819***	0.474***	0.972***	0.847***	0.483***	0.897***
	(0.137)	(0.090)	(0.194)	(0.138)	(0.092)	(0.195)
Trend				0.045***	0.020**	0.019*
				(0.014)	(0.008)	(0.011)
Export, lagged		0.479***	0.375***		0.475***	0.369***
		(0.040)	(0.055)		(0.039)	(0.053)
Long run aid elasticity		0.911***	1.556***		0.919***	1.421***
		(0.163)	(0.307)		(0.168)	(0.298)
Observations	3,751	3,728	3,728	3,751	3,728	3,728

Note: : The sample is 144 countries over the period 1981-2010. The average number of years for which we have country observations is 26. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. All regressions include time dummies.

When testing for systematic variation in the effect of Danish aid on exports we do not find systematic variation in the semi-elasticity with country income groups (Appendix-Table 7) or with the presence of a Danish representation in the recipient country (Appendix-Table 8). However, we do find statistically significant differences across regions (Appendix-Table 6) with lower returns in Latin America and Caribbean and possibly larger returns in East Asia and Pacific. We also find significant changes over decades (Appendix-Table 9). Therefore, we have estimated the alternative specification by decade. The results are given in Table 6.

As for the log-specification we observe a relatively large decrease in the impact of aid on export. However, we find a significant impact in all three decades. Focusing on the parameters in the GMM regression, the long run impact in the 2000s is only about 1/3 of the long run impact in the 1980s and comparing with the full sample results the impact in the 2000s is only 60% of the full sample estimate. Yet, considering the sampling uncertainty the latter difference is not statistically significant as we cannot reject the hypothesis that the long run effect is 1.5 in the 2000s

Table 6: The Gravity Regression by Decade, Alternative Specification of Aid

	1981-1990 (113 countries)			1991-2000 (137 countries)			2001-2010 (143 countries)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FE	FE	GMM	FE	FE	GMM	FE	FE	GMM
GNI+	0.615***	0.465***	0.612***	0.431***	0.433***	0.868***	0.440***	0.376***	0.855***
	(0.144)	(0.113)	(0.097)	(0.122)	(0.103)	(0.177)	(0.104)	(0.088)	(0.109)
Population	-0.968	-0.776*	-0.328*	-1.667***	-0.912*	-0.582**	-1.694**	-1.434**	-0.501
	(0.596)	(0.458)	(0.173)	(0.607)	(0.531)	(0.254)	(0.729)	(0.653)	(0.324)
Danish Aid	1.258***	1.059***	1.414***	0.731***	0.624***	0.924***	0.777***	0.625***	0.655**
	(0.352)	(0.313)	(0.447)	(0.160)	(0.139)	(0.291)	(0.242)	(0.234)	(0.258)
Export, lagged		0.304***	0.458***		0.193***	0.313***		0.174*	0.292***
		(0.044)	(0.061)		(0.063)	(0.103)		(0.089)	(0.092)
Long run aid elasticity		1.522***	2.611***		0.772***	1.344***		0.757***	0.925***
		(0.044)	(0.860)		(0.158)	(0.387)		(0.275)	(0.355)
Observations	1,058	1,058	1,058	1,286	1,264	1,264	1,407	1,406	1,406

Note: Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. All regressions include time dummies

6.5 Estimated Export Returns to Bilateral Aid

The parameter estimates in the two formulations of the gravity model are not directly comparable but we can compute export return estimates to illustrate the difference. In Table 7 we give export returns as they are estimated using the export/aid and export/dispGNI ratios in the data.

The first rows in Table 7 reports the ratios of average export to average aid and the average export to average disposable GNI. The latter ratio is presented both as the based on the overall averages from 1981 to 2010 and for the subset of the 2000s (2001-2010). These numbers are multiplied by the estimated parameters from the corresponding regression models to obtain the estimated export returns, reported in the bottom three rows.

Table 7: Estimated Average Export Returns

	All Countries	Priority Countries	Neighbourhood Programme
Average export / average aid, 1981-2010	4.06	0.64	19,8
Average export / average dispGNI (percent), 1981-2010	0.049	0.050	0.155
Average export / average dispGNI (percent), 2001-2010	0,050	0.044	0,150
	Cent per dollar (Rounded to nearest cent)		
Log specification (0.075*Export/aid ratio)	30	5	149
Alternative specification (1.556*Export/dispGNI (percent))	8	8	24
Alternative specification in 2000s (0.925*Export/dispGNI (percent), 2001-2010)	5	4	14

The ratios of average export to average aid differ dramatically between the two country groups. The ratio for the Neighbourhood Programme countries is 30 times larger than the ratio for the priority countries. Naturally, this is carried over to the estimated returns. The overall average return on a one-dollar increase in bilateral aid is an increase in exports of 30 cent in the long run, which is close to the 29 cent estimate for the Netherlands in Martìnez-Zarzoso et al. (undated). Still, the overall average masks that aid given to Neighbourhood Programme countries has an average return of 1.5 dollar while the average return to priority countries is only 5 cent.

Using the alternative specification, the returns vary somewhat less and the estimated overall average return is equal to the average return for the priority countries showing an increase in exports of 8 cent per aid dollar. The estimated average return for the Neighbor Programme countries is only 3 times larger, coming to 24 cents per dollar. The marked differences in the estimated returns illustrate the importance of the model specification uncertainty. In our view, the much smaller variation in export returns supports the alternative model specification.

Finally, because of the apparent change in the export/aid elasticity we also compute average returns for the 2000s as they are estimated from the alternative specification.[7] As seen the overall average return is

[7] Recall that the elasticity is not significantly different from zero in the log-specification (see Table 4) whereby the estimated return is also zero for the 2000s.

down to 5 cent per dollar in the 2000s, the return to and aid dollar given to the priority countries is 4 cent while we get 14 cent per dollar to the Neighbourhood Programme coutries, on average, in the 2000s.

Table 8: Estimated Export Returns to four specific countries in 2010

	Tanzania	Vietnam	Belarus	China
Export/aid ratio in 2010	0.10	1.60	26	2,870
Export/disposable GNI ratio in 2010 (percent)	0.05	0.11	0.10	0.04
	Cent per dollar (Rounded to nearest cent)			
Log specification (0.075*Export/aid ratio)	1	12	195	21525
Alternative specification (1.556*Export/dispGNI (percent))	8	17	16	6
Alternative specification in 2000s (0.925*Export/dispGNI (percent))	5	10	9	4

To give somewhat more concrete examples of the predicted export returns we show, in Table 8, the predicted returns for the four countries also given in Table 1; Tanzania, Vietnam, Belarus and China. As for Table 7 the first rows in Table 8 report the ratios of export-to-aid and export-to-disposable GNI (the latter in percent). But for the four countries these are not averages but the ratios as they were in 2010. Hence, we simulate a situation in which Denmark decides to increase aid to either of these countries by one additional dollar. The export returns as estimated by the log-specification again vary dramatically; from 1 cent in Tanzania to 215 dollar in China. Using the alternative specification, the returns vary much less. The most dramatic difference is the estimated return to aid to China that drops from the 215 dollar to 6 cent. In the alternative specification aid to China is actually giving the lowest export return. Vietnam and Belarus are on par in terms of returns, but it is still only 16-17 cent per dollar.

Finally, the magnitude of the parameter change from the 1980s to the 2000s, is illustrated in the last row in which we used the elasticity from the GMM regression for the 2000s to compute the returns. The result is easy to grasp: The impact in the 2000s is about 2/3 of the estimated impact based on the full sample. Hence, the estimated returns drop to at most 10 cent per aid dollar in the 2000s.

Overall, it appears that while the impact of bilateral aid on exports is statistically significant it is hardly a pivotal factor in economic terms.

7. Conclusion

Danish bilateral development assistance is a government to government transfer aimed at reducing poverty in the partner countries. In addition to the overall goal it is increasingly recognized that the

development cooperation may have positive externalities that are beneficial for the Danish economy and this Evaluation Study demonstrates that the bilateral assistance has a knock-on effect in the form of increased export from Denmark to the partner countries.

Bilateral development assistance may affect exports through three channels: direct aid tying; increasing recipient income, leading to increased imports, and decreased trade costs, say due to improved information about cultural and administrative customs and practices. Thus, as for preferential trade arrangements, bilateral aid has two potential economic effects; trade creation working thought income and benefitting all countries and trade diversion, by increasing donor exports at the expense of other exporters. Both effects are taken into account in the present econometric study.

The result for Denmark is in line with several recent studies of bilateral assistance from other donors, all using a common structural econometric model as the underlying framework for the analyses. Given the notorious difficulties in proving impacts of foreign aid in general, it is quite remarkable to note the unanimity in the results for bilateral assistance and donor exports. All studies, we have recorded, which use the gravity model of bilateral trade as the empirical framework find that bilateral aid has had a statistically significantly positive impact on exports to the recipient countries. The impact is not statistically significant for all periods in all models but the overall result is surprisingly well founded in the data spanning the past 30-50 years.

The parameter of interest in the econometric models estimates the percentage increase in exports following a percentage increase in aid to the specific country (the export/aid elasticity), or following a percentage point increase in aid relative to disposable GNI in the specific country (the export/aid semi-elasticity). These formulations indicate that the estimated return in terms of dollars of increased exports per dollar of additional aid varies over time and across countries, and it also implies that the dollar return is small for Denmark's main development cooperation partner countries simply because Danish export to these countries is small at the outset as they are poor and distant from Denmark. The overall estimated average export return is about 30 cent per aid dollar, which is surprisingly close to the 29 cent estimated for the Netherlands and quite far from the 1.4 dollar estimated for Germany. The overall average covers a wide variation from 5 cent per aid dollar for the Danish Priority Countries to 1.5 dollar for the group of countries in the Neighbourhood Programme. This illustrates how a regression parameter may well be highly statistically significant such that the presence of a positive effect is well established empirically, while at the same time the order of magnitude of the parameter indicates quite

small economic effects. Still, given that the positive impact of aid on exports is a pure knock-on effect, 5 cent per dollar may appear as a respectable return.

Having established the main result of a statistically significant positive effect of bilateral aid on Danish exports it is important to understand the limits of the econometric study, the main limitation being that the study is not useful as a tool for country selection in the aid allocation decision.

To be specific, the formulation of the econometric model provides a fairly precise estimate of the impact of small changes in aid to countries in which Denmark is already a bilateral donor. The main advantage of the model formulation is that the issue of reverse causality, meaning that part of the parameter estimate is actually measuring the impact of increased exports on bilateral aid instead of the impact of increased aid on exports, is unlikely to be a problem. This is the reason why the effect is interpreted as causal in the study, rather than just a correlation. Yet, the downside of this choice is that the model can only give information about marginal changes in aid. As a decision to give bilateral aid to a new country is not a marginal decision, the impact cannot be evaluated based on the results presented in the study. Likewise, the impact on exports following a decision to stop all aid to a country cannot be deduced from the regression results.

Another limitation of the study is the uncertainty about the precise functional form of the econometric model. Although the choice and transformation of the main explanatory variables adhere to a structural model the inclusion and transformation of bilateral aid is *ad hoc*. In this Evaluation Study, two different formulations are given and estimated: one follows the existing literature, while the other is new. The authors of this Evaluation Study prefer the new model formulation for three reasons. First of all, the existing literature use a regression specification in which the logarithm of aid is used as a regressor. This transformation creates a discontinuiety as many countries have zero aid inflows. Hence, in essence the modelformulation introduces two different gravity models, one for aid recipients and another for non-recipients. In the new model formulation, using (the log of one plus) aid as a fraction of disposable GNI, the discontinuiety problem does not arise. Second, the determinig factor for the estimated export return is the ratio of bilateral exports to bilateral aid in the standard model formulation while it is the ratio of bilateral exports to disposable GNI (in the importing country) in the new formulation. Here, it is clear that the first ratio will tend to infinity as aid becomes small, leading to very big export returns in large countries receiving very small amounts of aid from Denmark, while such extreme outcomes will not occour in the new formulation. Furthermore, the ratio of exports to disposable GNI is an important ratio in the gravity model, showing that the new regression formulation is well in accord with

the underlying economic model. Finally, the empirical distributions of the two ratios shows that the export-to-aid ratio, with a coefficient of variartion of 18, has a significantly larger relative dispersion than the export-to-disposable GNI ratio, which has a coefficient of variation of 6 for the same country observations. Thus, as the distributions of the ratios determine the distributions of the estimated export return, it follows that the new model formulation will give a return distribtuion with lower relative variance, leading to less uncertain estimates of mean returns. Interestingly, in both cases the estimated impact of aid is positive and statistically significant, such that the main result of the analysis is actually strengthened as the sign and significance is robust to changes in the model formulation. Unfortunately, the estimated export returns in dollar terms in particular the overall average and the average for the countries in the Neighbourhood Programme differs substantially across the two model formulations. Thus, although the export return is almost certainly positive it is difficult to give a precise estimate, both for individual countries and for country groups.The new model formulation has fairly low export returns for aid to the Neighbourhood Programme countries (24 cent per dollar). But, the other model formulation cannot be excluded, whereby the export return on aid to the Neighbourhood Programme countries may be as much as 1.5 dollar per aid dollar. This shows how the model uncertainty leads to quite substantial uncertainty in the country specific export returns.

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Appendix 1: Data

The data comes from five different sources:

1. World Development Indicators (WDI), published by the World Bank – available online at www.worldbank.org/data. From this source we obtained individual countries (i) GDP (current USD), (ii) GNI (current USD), (iii) Population, (iv) Official Exchange Rate and (v) Income and Location Classifications. Moreover bilateral aid data were also collected to check the consistency with the DAC/OECD numbers.
2. DAC/OECD Aid Data, published by OECD via the Query Wizard for International Development Statistics – available online at www.stats.oecd.org/qwids. From this data source we obtained individual countries (i) Total aid receipts (current USD), (ii) Bilateral aid receipts from DAC donors (in current USD) including a disaggregation of receipts coming from Danish Development Cooperation, (iii) Multilateral aid receipts (current USD) and (iv) Other (non-DAC bilateral) aid receipts (current USD). Specifically the net bilateral aid flows from DAC donors are the net disbursements of official development assistance (ODA) or official aid from the members of the Development Assistance Committee (DAC). Net disbursements are gross disbursements of grants and loans minus repayments of principal on earlier loans. ODA consists of loans made on concessional terms (with a grant element of at least 25 percent. calculated at a rate of discount of 10 percent) and grants made to promote economic development and welfare. Official aid refers to aid flows from official donors to more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries. Official aid is provided under terms and conditions similar to those for ODA.
3. UN COMTRADE, published by the United Nations Statistical Division – available online at www.comtrade.un.org. From this data source we obtained bilateral trade data: (i) Exports (current USD) from Denmark by receiving country and (ii) Imports by Denmark by sending country.
4. The Observatory of Economic Complexity. Published by Alexander Simoes, MIT – available online at www.atlas.media.mit.edu. From this data source we obtained information and illustrations on the product specific bilateral trade flows.
5. Information on countries where Denmark is officially represented (Embassy etc.) is obtained from http://um.dk/da/~/media/UM/Danish-site/Images/Om-os/Ministeriet/Repr-kort/data-repr-2014.pdf.

Appendix 2: Detailed Regression Tables

Appendix Table 1: Basic Regression Results (Full listing)

	(1) FE	(2) FE	(3) GMM	(4) FE	(5) FE	(6) GMM
GDP	0.559***	0.308***	0.586***	0.482***	0.273***	0.504***
	(0.089)	(0.058)	(0.141)	(0.089)	(0.056)	(0.118)
Population	-1.267***	-0.592***	-0.279***	-1.232***	-0.582***	-0.158*
	(0.350)	(0.198)	(0.079)	(0.342)	(0.194)	(0.087)
GDP DK				0.266**	0.240***	0.238**
				(0.104)	(0.067)	(0.098)
Population DK				-6.812*	-4.543**	-6.346***
				(3.450)	(1.988)	(2.148)
Danish Aid	0.059***	0.041***	0.046***	0.059***	0.039***	0.035**
	(0.018)	(0.012)	(0.015)	(0.018)	(0.012)	(0.015)
Other Bilateral Aid	0.015	-0.001	0.013	-0.000	-0.007	-0.015
	(0.037)	(0.021)	(0.028)	(0.038)	(0.022)	(0.026)
Multilateral Aid	0.041	0.015	-0.004	0.039	0.013	-0.016
	(0.026)	(0.015)	(0.020)	(0.026)	(0.015)	(0.019)
No Danish Aid	0.803***	0.548***	0.562***	0.796***	0.532***	0.441**
	(0.237)	(0.162)	(0.198)	(0.241)	(0.163)	(0.195)
No Other Bilateral Aid	0.135	-0.082	0.251	-0.150	-0.198	-0.256
	(0.695)	(0.395)	(0.525)	(0.703)	(0.407)	(0.476)
No Multilateral Aid	0.536	0.177	0.070	0.518	0.154	-0.059
	(0.421)	(0.248)	(0.308)	(0.423)	(0.246)	(0.309)
Trend				0.050***	0.021**	0.010
				(0.014)	(0.008)	(0.008)
Export, lagged		0.480***	0.393***		0.474***	0.385***
		(0.048)	(0.054)		(0.048)	(0.052)
Long run aid elasticity		0.078***	0.075***		0.075***	0.057***
		(0.021)	(0.025)		(0.022)	(0.024)
Observations	3,824	3,798	3,798	3,824	3,798	3,798

Note: The sample is 144 countries over the period 1981-2010. The average number of years for which we have country observations is 26.38. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. Regressions (1)-(3) include time dummies.

Appendix Table 2: Regional Variation in Aid Impact

	(1) FE	(2) FE	(3) GMM
GDP	0.578***	0.321***	0.552***
	(0.078)	(0.053)	(0.113)
Population	-1.241***	-0.585***	-0.183***
	(0.350)	(0.202)	(0.070)
Danish Aid (Sub-Saharan Africa)	0.044***	0.034***	0.049**
	(0.016)	(0.011)	(0.019)
East Asia and Pacific	0.053**	0.023	-0.025
	(0.026)	(0.015)	(0.020)
Eastern Europe and Central Asia	0.000	0.001	-0.009
	(0.015)	(0.008)	(0.012)
Latin America and the Caribbean	0.004	0.001	-0.024**
	(0.013)	(0.007)	(0.010)
Middle East and North Africa	-0.009	-0.007	-0.008
	(0.010)	(0.005)	(0.010)
South Asia	0.010	0.007	0.004
	(0.016)	(0.010)	(0.012)
Other Bilateral Aid	0.028	0.006	0.017
	(0.036)	(0.021)	(0.028)
Multilateral Aid	0.040*	0.014	-0.013
	(0.023)	(0.014)	(0.021)
No Danish Aid	0.723***	0.510***	0.478**
	(0.215)	(0.156)	(0.205)
No Other Bilateral Aid	0.336	0.027	0.288
	(0.654)	(0.378)	(0.520)
No Multilateral Aid	0.515	0.160	-0.080
	(0.389)	(0.240)	(0.322)
Export, lagged		0.471***	0.448***
		(0.049)	(0.046)
F-test of equal aid elasticities (*p*-value)	0.224	0.254	0.008
Observations	3,824	3,798	3,798

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 3: Income Variation in Aid Impact

	Low Income			Low Income and Lower Middle Income		
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	GMM	FE	FE	GMM
GDP	0.561***	0.310***	0.625***	0.561***	0.309***	0.551***
	(0.089)	(0.058)	(0.123)	(0.087)	(0.057)	(0.140)
Population	-1.247***	-0.588***	-0.325***	-1.265***	-0.591***	-0.211***
	(0.348)	(0.197)	(0.085)	(0.349)	(0.198)	(0.078)
Danish Aid (Higher Income)	0.065***	0.043***	0.046***	0.055***	0.039***	0.037**
	(0.019)	(0.012)	(0.017)	(0.017)	(0.012)	(0.016)
Danish Aid x Lower Income	-0.023*	-0.007	0.016	0.004	0.002	0.009
	(0.012)	(0.006)	(0.013)	(0.010)	(0.006)	(0.007)
Other Bilateral Aid	0.018	-0.001	-0.002	0.013	-0.002	0.007
	(0.038)	(0.021)	(0.035)	(0.037)	(0.021)	(0.028)
Multilateral Aid	0.040	0.014	-0.008	0.041	0.015	-0.002
	(0.025)	(0.015)	(0.022)	(0.026)	(0.015)	(0.021)
No Danish Aid	0.847***	0.563***	0.595***	0.783***	0.537***	0.525***
	(0.239)	(0.165)	(0.229)	(0.227)	(0.160)	(0.196)
No Other Bilateral Aid	0.146	-0.080	-0.011	0.099	-0.100	0.154
	(0.701)	(0.398)	(0.647)	(0.680)	(0.386)	(0.515)
No Multilateral Aid	0.532	0.175	0.037	0.535	0.177	0.153
	(0.416)	(0.247)	(0.322)	(0.421)	(0.248)	(0.324)
Export, lagged		0.478***	0.430***		0.480***	0.415***
		(0.049)	(0.055)		(0.048)	(0.052)
Observations	3,824	3,798	3,798	3,824	3,798	3,798

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 4: Dependence on Danish Representation in Importing Country

	(1) FE	(2) FE	(3) GMM
GDP	0.560***	0.309***	0.572***
	(0.091)	(0.059)	(0.141)
Population	-1.265***	-0.592***	-0.242***
	(0.348)	(0.197)	(0.092)
Danish Aid (w. Representation)	0.064***	0.043***	0.057***
	(0.019)	(0.013)	(0.015)
Danish Aid x No Representation	-0.012	-0.006	-0.004
	(0.011)	(0.006)	(0.006)
Other Bilateral Aid	0.018	0.000	0.013
	(0.038)	(0.022)	(0.031)
Multilateral Aid	0.039	0.013	-0.007
	(0.026)	(0.015)	(0.020)
No Danish Aid	0.775***	0.534***	0.680***
	(0.231)	(0.159)	(0.206)
No Other Bilateral Aid	0.162	-0.066	0.251
	(0.703)	(0.402)	(0.564)
No Multilateral Aid	0.518	0.166	0.047
	(0.421)	(0.249)	(0.299)
Export, lagged		0.479***	0.404***
		(0.048)	(0.052)
Observations	3,824	3,798	3,798

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 5: Constancy of the Export-Aid Elasticity over Decades

	(1)	(2)	(3)
	FE	FE	GMM
GDP	0.553***	0.310***	0.619***
	(0.089)	(0.056)	(0.126)
Population	-0.917***	-0.404**	-0.314***
	(0.326)	(0.179)	(0.086)
Danish Aid, 1980s	0.085***	0.057***	0.047***
	(0.020)	(0.014)	(0.015)
Danish Aid x 1990s	-0.011*	-0.007*	-0.002
	(0.006)	(0.004)	(0.004)
Danish Aid x 2000s	-0.032***	-0.019***	-0.016***
	(0.009)	(0.005)	(0.006)
Other Bilateral Aid	0.031	0.008	0.016
	(0.037)	(0.021)	(0.031)
Multilateral Aid	0.041	0.015	-0.005
	(0.026)	(0.016)	(0.022)
No Danish Aid	0.949***	0.640***	0.529***
	(0.244)	(0.170)	(0.185)
No Other Bilateral Aid	0.405	0.073	0.336
	(0.690)	(0.398)	(0.566)
No Multilateral Aid	0.470	0.145	0.062
	(0.420)	(0.255)	(0.326)
Export, lagged		0.469***	0.397***
		(0.048)	(0.054)
Observations	3,824	3,798	3,798

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 6: Regional Variation in Aid Impact, alternative specification of aid

	(1)	(2)	(3)
	FE	FE	GMM
GNI+	0.679***	0.385***	0.649***
	(0.092)	(0.059)	(0.081)
Population	-1.181***	-0.578***	-0.209**
	(0.287)	(0.171)	(0.088)
Danish Aid (Sub-Saharan Africa)	0.726***	0.472***	0.882***
	(0.137)	(0.089)	(0.202)
x East Asia and Pacific	5.230***	2.344***	-1.607*
	(1.095)	(0.480)	(0.850)
x Eastern Europe and Central Asia	7.850***	2.619*	-1.823
	(1.382)	(1.391)	(1.437)
x Latin America and the Caribbean	-0.560*	-0.534***	-0.715***
	(0.310)	(0.152)	(0.230)
x Middle East and North Africa	-1.812**	-0.737	0.872
	(0.738)	(0.527)	(1.598)
x South Asia	1.241**	0.404	-1.005***
	(0.597)	(0.357)	(0.381)
Export, lagged		0.466***	0.425***
		(0.041)	(0.054)
Observations	3,751	3,728	3,728

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 7: Income Variation in Aid Impact, alternative specification of aid

	Low Income			Low income and Lower Middle Income		
	(1)	(2)	(3)	(4)	(5)	(6)
	FE	FE	GMM	FE	FE	GMM
GNI+	0.683***	0.378***	0.733***	0.679***	0.378***	0.715***
	(0.102)	(0.063)	(0.082)	(0.104)	(0.063)	(0.080)
Population	-1.178***	-0.560***	-0.409***	-1.175***	-0.560***	-0.290**
	(0.291)	(0.166)	(0.148)	(0.290)	(0.166)	(0.120)
Danish Aid (Higher Income)	1.002**	0.445*	0.542*	5.653	3.257**	1.295
	(0.421)	(0.260)	(0.315)	(3.475)	(1.636)	(1.650)
Danish Aid x Lower Income	-0.231	0.037	0.435	-4.840	-2.786*	-0.323
	(0.455)	(0.278)	(0.362)	(3.484)	(1.640)	(1.684)
Export, lagged		0.479***	0.379***		0.478***	0.392***
		(0.039)	(0.055)		(0.040)	(0.055)
Observations	3,751	3,728	3,728	3,751	3,728	3,728

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 8: Dependence on Representation in Importing Country

	(1) FE	(2) FE	(3) GMM
GNI+	0.677***	0.379***	0.756***
	(0.106)	(0.065)	(0.083)
Population	-1.181***	-0.559***	-0.339**
	(0.292)	(0.167)	(0.135)
Danish Aid (w. Representation)	0.804***	0.478***	1.054***
	(0.137)	(0.094)	(0.198)
Danish Aid x No representation	0.003	-0.001	-0.001
	(0.008)	(0.004)	(0.005)
Exports, lagged		0.480***	0.403***
		(0.039)	(0.056)
Observations	3,751	3,728	3,728

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

Appendix Table 9: Constancy of the Aid Parameter over Decades, alternative specification

	(1) FE	(2) FE	(3) GMM
GNI+	0.670***	0.380***	0.737***
	(0.101)	(0.062)	(0.081)
Population	-0.897***	-0.397**	-0.386**
	(0.295)	(0.167)	(0.186)
Danish Aid	-0.774*	-0.545**	-0.227
	(0.415)	(0.273)	(0.343)
Danish Aid x 1990s	0.009***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)
Danish Aid x 2000s	0.016***	0.010***	0.010***
	(0.004)	(0.003)	(0.003)
Export, lagged		0.467***	0.363***
		(0.039)	(0.054)
Observations	3,751	3,728	3,728

Note: The sample is 144 countries over the period 1981-2010. Standard errors in parentheses are robust to heteroskedasticity and cluster correlation at the country level. The regressions include time dummies.

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