Working Paper

Trade with Developing Countries and Development Assistance

Is there a link between Canadian exports and official development assistance?

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About this Report

This report explores the **relationship between Canadian official development assistance** (ODA or foreign aid), and **Canada's trade with developing countries** (specifically Canadian exports). We examine the relationship using an augmented gravity model. This is the **first attempt to measure the elasticity of Canadian exports to aid**.

Main Findings

We take a highly conservative and cautious approach in our econometric analysis and its interpretation. Our findings are consistent with the wider literature. We find a **positive and statistically significant association between Canadian exports and ODA**. This does not suggest causality, nor do we completely rule out reverse causation.

Nevertheless, for a subset of Canadian ODA-recipient countries over the period 1989 to 2015, we find the **elasticity of Canadian goods exports to gross ODA was 0.063% and statistically significant (at 0.01)**. The elasticity of exports to net ODA was 0.072% and statistically significant (at 0.01).

The **average return over the period in question on a dollar in gross ODA was $1.10 in exports**. The average return on a dollar of net ODA was $1.19 in exports.

The effects suggest that, in addition to the core moral and humanitarian purpose of aid, an added benefit over time may be that the same investment has the effect of boosting Canadian exports to aid recipient countries.

We reiterate that the main purpose of foreign aid is and should be poverty reduction. Our aim via this analysis is in no way to rehash old "tied aid" debates. Canadian ODA is largely untied and this is as it should be. Our **empirical findings point to an effect that is additional and complementary to the core moral and humanitarian imperative that is and should continue to be the main driver behind Canada's foreign aid**.

Further Research

Descriptive analysis at the sector/product level of the composition of Canadian exports, revealed comparative advantage (RCA), and Canada's trade promotion priorities is provided in annexes.

Based on this analysis we make the case that **there are opportunities to better link trade and development strategies**, both in areas of current strength (e.g. agriculture and agri-food) and especially from a forward looking perspective with regards to high-tech, high-value added and 'sunrise' sectors (e.g. clean technologies), **in a manner that is a 'win-win-win' for development impact, Canada's international priorities and future trade and investment diversification**.

Exploring the above opportunities requires going beyond econometric analysis. Our strategy is to pursue the same through mixed-method case studies, which is our key next step, and will form the basis of an accompanying paper.

The underlying data and code files used in this analysis are available upon request to **info@cidpnsi.ca**.

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Introduction and Motivation

This report explores the **relationship between Canadian official development assistance (ODA) spending, or foreign aid, and trade (specifically Canadian exports). We examine the relationship using an augmented gravity model.** Gravity models are widely used in the trade literature to investigate the effect of structural, geographic, and policy variables on trade and investment performance.

There is a vast literature on the impact of donor aid on recipients from the macro to micro level, employing a range of methods. However, systematic, and especially econometric, analyses of the impact of aid on those providing it (i.e. donors) are less common.

Our interest is in examining this linkage specifically from the perspective of Canadian ODA and export performance. This is driven by two factors:

- We find that there is a somewhat surprising literature—both in terms of the number of studies and their findings—that has looked at this relationship, primarily in the case of European donors.

- Yet, to our knowledge, there is not a single study that has systematically (econometrically or otherwise) examined the relationship for Canadian ODA and export performance.

Our modest contribution is to undertake this analysis with the aim of starting a wider conversation about the direct and indirect economic effects of aid provision on donor economies. This is part of a wider effort to update the narrative around support for development assistance especially in Canada.

At the outset, we must stress that our intention is in no way to rehash old "tied aid" debates. Canadian ODA is largely untied (98.5%, see annex) and this is as it should be. ODA should be motivated by need and its potential efficacy in solving development challenges. Over time, this is the direction most donors have moved towards by untying a greater share of their aid. The case for ODA is, and largely should be if not entirely, motivated by the moral imperative.

The effects uncovered here are in addition to the core aim and main moral/humanitarian imperative that drives and should drive aid, including and especially Canadian aid (which as we have shown elsewhere tends to be well-targeted towards poverty compared to other donors; see Data Report, 2016). The analysis is merely an effort to systematically tease out potential direct economic effects, if any, in this case proxied by Canada's export performance.

The remainder of this report is organized as follows: the next section presents our main findings and discusses its interpretation. The section thereafter highlights findings from the broader literature, a systematic review of which is provided in an annex, and contextualizes our findings within the same. The section that follows discusses our econometric model, data and specifications (additional details, extended specifications and robustness checks are provided in an annex). A final section presents conclusions for further discussion.

Main Findings

This research, to our knowledge, represents the first attempt to measure the elasticity of Canadian exports to aid. This is surprising given Canada is both a major donor and highly reliant on trade. By volume, Canada ranks among the top 10 OECD-DAC donors, i.e. in the top half of the main group of aid providers. One out of three Canadian jobs relies on trade, most of which takes place with the US (on average, 75% of imports and as high as 89% of exports come from and go to the US). However, the share of developing countries in Canadian trade has been rising from under 7% (1989) to almost 10% (2015) of total Canadian goods exports.[1] In this econometric analysis, we regress basic gravity model variables, augmented to include Canadian ODA, over the period 1989 to 2015, to estimate the relationship and pattern with that of Canadian exports, which is our dependent variable. We employ two different variants of the ODA variable (net and gross ODA). The details are provided in subsequent sections, but to summarize, our main findings from the augmented gravity model, which applies to Canadian exports to ODA recipient countries, are as follows:

• Elasticity of Canadian goods exports to gross ODA was 0.063% and statistically significant (at 0.01).

• Elasticity of exports to net ODA was 0.072% and statistically significant (at 0.01).

• Average return over the period in question on a dollar in gross ODA was $1.10 in exports.

• Average return on a dollar of net ODA was $1.19 in exports.

Our approach to this analysis was highly conservative, i.e. we embarked on it with a huge dose of skepticism and the expectation that we find no relationship between aid and exports as our null hypothesis. Therefore, the results, to us, are surprising. The positive and statistically significant relationship between Canadian ODA and exports, while unexpected, is consistent with findings from the wider literature (which is discussed below and summarized systematically in the annex).

Our approach most closely resembles the work of Martínez-Zarzoso, Nowak-Lehemann et al. (2016), which pose the question: does German aid boost German exports and employment? The authors employ a similar augmented gravity model in a single donor framework for Germany, and find that in the long-run German aid is positively and statistically significantly associated with an increase in German exports to the same aid recipient countries. Their long-run elasticity for German aid and exports (at 0.062%) is very similar to our findings for Canada.

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[1] The share of Canadian exports to developing countries tends to decline during periods of economic crises. For e.g. during the Asian crisis of the late 1990s, developing countries' share of Canadian exports halved. In the 2008-09 global economic crisis the impact was smaller, but it is noteworthy that the ratio has since plateaued. This indicates that during the post crises recovery exports to more advanced developed economies have been more resilient as compared to exports to developing countries.

These results, however, should be interpreted with caution, as they are sensitive to model specification and data choice as others have shown (Mendez-Parra and Willem te Velde, 2017). Nevertheless, the findings stand up to our standard and extended robustness checks.[2]

What is the Appropriate Interpretation of these Results?

Despite confidence in our careful analysis and conservative approach, we remain cautious and stress that the results below should not be extrapolated to mean more than they may:

- Canadian ODA, unintentionally, supports Canadian exports. This is despite, not because of 'tying', which Canada has consistently moved away from.

- Our econometric results indicate a positive and statistically significant relationship between Canadian exports and both gross and net ODA using an augmented gravity model (and controlling for the basic variables we know affect exports).

- Our findings are consistent with the broader literature, which tends to indicate a positive and statistically significant relationship between a donor's exports and its aid.

- However, the broader literature is less conclusive about the strength of the impacts and how they have evolved over time.

- The literature suggests that the impacts are relatively small, i.e. the elasticities tend to be low, especially in more recent studies.

- A safe inference from this is that ODA provision is not, by itself, a great use of public resources for donor export promotion. But then again, boosting donor exports is not the aim of aid (at least not since donors have begun to "untie" aid).

- From an aid and development perspective, however, the effects seem strong enough to suggest tha, in addition to the core moral and humanitarian purpose of aid, an added benefit over time is that the same investment has the effect of boosting Canadian exports to aid recipient countries.

- **The way to interpret this is that a handy byproduct of Canada's development assistance— the main purpose of which is and should be poverty reduction—seems to be that Canadian exports to the same countries have been higher than they otherwise might have been absent that same aid. In that sense, from an export perspective, Canadian ODA represents a high return on investment, given $1 in ODA likely kept exports higher by between $1.10 and $1.19, without this being the main objective of development assistance.**

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[2] Beyond standard econometric techniques, as discussed in later sections and detailed in the annex, we re-run the model with different specifications including with and without the largest export markets among developing country ODA recipient—China and Mexico, which we suspected may be driving much of the result, both given the large share they make up of exports and their transition over the period from significant to very small Canadian ODA recipients. Removing China and Mexico, which together account for over 50% of Canadian exports to ODA recipients, reduces the significance and magnitude of both gross and net ODA.

What Does the Broader Literature Say

The literature on trade effects of aid provision on donor economies is surprising on two counts: first, there is a larger body of empirical work than one might have expected given this relationship is hardly discussed outside of tied aid debates. Second, even more surprisingly, most of the literature finds a positive and statistically significant link between donor exports and ODA. Some have gone further to look at direction of causality and concluded that not only is the association positive and significant, but ODA 'Granger causes' exports to aid recipient countries (Nowak-Lhemann et al., 2009).

Results from the empirical literature are systematically summarized in the annex. Our broad take-away(s) are as follows:

- Beyond the generalizable finding of a positive and statistically significant association, which holds across both multi and single donor studies, the results and elasticities vary greatly. For e.g. Mendez-Parr and te Velde (2017a) calculate that every $1 of direct bilateral aid leads to a $0.22 increase in UK exports, which equates to a return of $1.3billion in exports on $5.9billion in aid. This in turn supports 12,000 jobs. The same researchers find that in the EU context $1 in EC aid increases EU exports between $1.02 and $3.69; and for individual members increases exports between $0.19 and $2.29 (Mendez-Parr and te Velde, 2017).

- Our findings for Canada fall in between this range, i.e. far higher than the UK and the low end of the range for EU member states, but far lower than the high end of the EU/ EC range.

- More recent studies tend to find lower elasticities. Methods other than gravity modeling, such as simulations at the EU level by Holland and te Velde (2012) and Carreras et al. (2016), also find low elasticities. Others attribute low elasticity to the offsetting effect of prices (Mendez-Parra and Willem te Velde, 2017).

- A reasonable conclusion is that results are highly sensitive to methodology and data choices (ibid).

The 'Why' Question

- The empirical research is weakest on the 'why' question, i.e. even if it is accepted there is a positive linkage between a donor's aid and its export performance in a partner country, why is this the case? The theory is weak and leaves room for further research, especially if complemented by case-studies or other mixed method approaches, including at the sectoral level.

- In response to the 'why' question, some have suggested aid tying as a possible explanation. Indeed, well into the 1990s nearly half of all donor aid was 'tied' to the procurement of donor-based goods and services, i.e. donor exports. While this has

changed in recent years, the extent of 'untying' is likely overstated compared to the reality in practice where much of the aid still comes with strings attached, though not necessarily linked to procurement of donor exports (ODI, 2008).

- The data doesn't seem to support the tying explanation. Even without tying, aid seems to have a similar export effect (Arvin and Baum, 1997; Arvin and Choudhry, 1997; Arvin et al., 2000).

- Other factors may be at play, such as goodwill, trade concessions, or aid and aid workers acting as indirect export promotors much like diplomatic presence does (Moons and van Bergeijk, 2011).

- Another possible channel is that aid may alter recipient preferences for technology, creating a permanent link with the exports of donors. For example, previous infrastructure projects financed by aid may create a requirement for inputs produced by the donor (Djajic et al., 2004). This could even be the case for 'soft infrastructure' and technical support as these may, in some cases, create greater familiarity between donor country-based providers and recipient country players.

- In our view, the most likely linkages are also the most general. Sustaining assistance at certain levels enhances living standards and has potential macroeconomic effects, such as via investment, productivity, and growth. This can have the effect of raising demand, including for donor exports (Tarp, 2012).

- Another weakness of extant studies may be that they neglect the impact of a few large export destinations, such as China. In our analysis, we made specific note of this and re-ran regressions without China (and Mexico), which account for over 50% of Canadian exports to the sample group, but account for a very small share of ODA (therefore increasing the magnitude of the aid effect). The elasticity for both net and gross Canadian ODA declines, especially with the exclusion of China (see annex).

Econometric Model, Data and Results

The methodology and model employed here follows the empirical trade literature. Gravity models are common in trade analysis and are useful in assessing the strength and relevance of basic factors that affect a country's trade pattern. Our model, associated data and sources are given below and discussed in detail thereafter. The gravity model is regressed on unbalanced panel data from 1989-2015 with 3218 observations for 146 ODA recipients.

$$lnX_j = \beta_0 + \beta_1 lnGDP_{CA} + \beta_2 lnGDP_j + \beta_3 lnDist_{CAj} + \beta_5 lnODA_j + \beta_6 FTA\_WTO_{Cadj} + \beta_7 ComLeg + \beta_8 \ln Pop_j + \varepsilon$$

X_j denotes Canada's exports to country j.

GDP_{CA} denotes Canada's GDP.

GDP_j denotes the GDP of partner country j.

$Dist_{CAj}$ denotes the distance of country j from Canada.

ODA_j denotes the Canadian official development assistance disbursement to partner country j.

FTA_WTO is a dummy variable that denotes if the partner country is a signatory FTA partner.

$ComLeg$ is a dummy variable where 1 indicates if the partner country has the same legal system.

Pop_j denotes the size of the population in partner country j.

Table 1: Econometric Model Variables

Variable	Denoted in the Gravity Model as	Description	Unit	Data Sources
Export	lnX_j	Canadian Export at HS2 level	Current USD	UN Comtrade
ODA	$lnODA_j$ • Gross ODA: lnCadGrsODA • Net ODA: lnCadNetODA	Canadian bilateral Official Development Assistance	Current USD	OECD-DAC
GDP	• Canadian GDP: $lnGDP_{CA}$ • Partner GDP: $lnGDP_j$	Reflect economic size and demand power of trade partners	Current USD	CEPII with data from World Bank Development Indicators (WDI)
Distance	$lnDist_{CAj}$	Bilateral weighted distance	kilometre	CEPII
FTA – WTO	FTA_WTO_{Cadj}	1: Existing in-force FTA between Canada and the partner	Binary 0/1	CEPII with data from WTO – RTA database
Common Legal System	$ComLeg$	1: Common legal origins after transition	Binary 0/1	CEPII
Population	$lnPop_j$	Population size		CEPII with data from World Bank Development Indicators (WDI)

We ran the model first on a full set of Canadian trade partners. The preponderance of advanced economies, especially the US, distorts Canadian gravity model results for trade. The US-Canada trade relationship is not only the largest in the world, it is also exceptional in the sense that the US share of Canadian trade is higher than any other major bilateral trading relationship and bilateral trade is tariff free under the auspices of NAFTA.[3]

We run separate iterations of the regression with and without the US to investigate the extent of the distortion on elasticities. By including an ODA variable, the impact of the US and all other advanced economy trade partners is solved, as this removes all non-ODA recipients from the sample (see columns 3 and 4 in the main regression results on the following page).

Main Regression Results

Table 2: Main Regression Results

VARIABLES	(1) World	(2) Non-US	(3) Gross ODA	(4) Net ODA
lnCadGrsODA			0.0636***	
			(0.0177)	
lnCadNetODA				0.0723***
				(0.0183)
lnGDP_CA	0.0710**	0.188***	-0.0779	-0.0678
	(0.0341)	(0.0520)	(0.0612)	(0.0637)
lnGDPj	1.034***	0.972***	1.033***	0.959***
	(0.0177)	(0.0156)	(0.0318)	(0.0323)
lnDist	-0.699***	-0.336***	-0.360***	-0.416***
	(0.0544)	(0.0831)	(0.0577)	(0.0603)
FTA_WTO	0.747***	0.406***	0.270***	0.323***
	(0.0718)	(0.0742)	(0.0711)	(0.0754)
ComLeg	0.832***	0.578***	0.128**	0.103*
	(0.0423)	(0.0664)	(0.0539)	(0.0596)
lnPop_j	0.00981	-0.0108	-0.0799**	-0.0338
	(0.0225)	(0.0205)	(0.0353)	(0.0363)
Constant	3.194***	7.818***	-2.312	0.513
	(1.121)	(1.410)	(1.658)	(1.641)
Observations	4,705	4,678	3,218	3,078
R-squared	0.988	0.819	0.926	0.877

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

[3] Albeit this is under renegotiation.

This gravity model is estimated using Poisson Pseudo Maximum Likelihood estimator (PPML) that provides a robust error term correcting for heteroscedasticity and autocorrelation detected in the diagnostics testing. The PPML estimator was first introduced by Santos-Silva and Tenreyno in 2006 to improve the estimated coefficients in addition to generating robust standard errors in the presence of heteroscedasticity and autocorrelation in a log-linear model (Santos Silva & Tenreyro, 2006). The PPML estimator is also used as there is no evidence for multicollinearity found among the variables in the gravity model.

Variables in the Model and Their Relationships

The most basic gravity variable is distance. More trade is likely to take place between physically closer partners reflecting lower trade costs but also greater familiarity. The variable remains significant throughout, though the sign flips to negative when the US is excluded and the model is focused on ODA countries. As predicted, distance has a negative correlation with Canadian exports. A 1% increase in distance reduces Canadian export by 0.32% to 0.49% for its non-US partners.

Exports to non-US partners are positively correlated with Canadian GDP, which reflects Canada's overall economic performance. A 1% increase in Canadian GDP will increase exports by 0.19% and only 0.07% for the model with the US included. This indicates that the ability to extend and facilitate exports to non-US partners depends on the overall performance of the economy. However, Canadian GDP is not an important determinant for exports to ODA partners.

Canadian exports have an almost perfect elasticity to its partner's GDP variable, which reflects the size of demand for Canadian exports. Increase in partner GDP boosts Canadian exports by the same percentage and vice versa.

Excluding the US from the gravity model reduces the magnitude of the elasticity of some of the variables that reflect the characteristics of the US as our closest neighbour and largest free trade agreement (FTA) partner with a common legal system. The coefficients for the distance, FTA, and common legal system variables are inflated by 50% - 100% with the inclusion of exports to the US in the model.

Canadian exports to ODA recipients have distinct characteristics compared to exports to non-ODA partners, which reflect the structural differences in the trade relationship with developing countries. Partners' GDP and geographical distance have the same sign and are of roughly the same impact as well. Common legal system and FTA variables also have the same sign athough of lower elasticity for ODA models. The lower elasticity for FTA partners in the ODA sample can be attributed to the fact that Canada only has a few FTAs in force with developing countries, although is currently working towards negotiations with emerging markets such as China and ASEAN.

The model was tested using both gross ODA and net ODA. Gross ODA is the actual amount of disbursement in each year while net ODA deducts any loan repayments and other offsetting entries, such as debt forgiveness and grant recoveries from the gross ODA amount (OECD, 2017).

Correlation vs. Causation and Direction of Causality

Despite finding a positive correlation between Canadian ODA and exports to the ODA recipients, this preliminary research has not established causality. Nor can we confirm the absence of reverse causality. In other words, while we find a positive and statistically significant correlation, that does not mean those exports are caused by the presence of Canadian ODA.

Endogeneity of trade policy is a persistent issue in the trade literature (Yotov, Piermartini, Monteiro, & Larch, 2016). The difficulty in finding good instrumental variables and the limited reliability of other ad hoc solutions to confirm whether trade is driven by a trade policy, or a trade policy is constituted based on the existing trade relationship, complicates the task of unpacking causality. A survey of studies investigating reverse causality between the effects of FTAs and trade flows has found conflicting evidence (Baier & Bergstrand, 2007).

However, the likelihood of a reverse causality for Canadian ODA and exports to ODA countries is relatively low based on two arguments: from a data standpoint, China and Mexico account for roughly 50% of exports to ODA recipients, but received less than 5% of Canadian ODA during the 1989-2015 sample period. Furthermore, from a policy standpoint, Canada has affirmed its commitment to 'untie' its development aid since 2008 in line with the recommendations of the OECD (Office of the Minister of International Cooperation, 2008). Confirmation of causality is an aspect that could be explored in extending and refining the findings of this preliminary study.

Conclusions for Further Discussion

This study represents the first attempt to measure the elasticity of Canadian exports to aid. The objective of the study is not to rehash old 'tied aid' debates. Canadian aid is largely 'untied' and this is as it should be. Aid should be driven by the moral and humanitarian imperative—not by commercial motives. Poverty reduction and the efficacy of aid in addressing development challenges should be the main criteria for aid allocation.

The effects we analyze are in addition to the core moral and humanitarian imperative that drives and should drive aid. Our aim is to systematically tease out potential direct economic effects, if any, for Canada as an aid provider, in this case proxied by Canada's export performance. This preliminary analysis is aimed at starting a wider conversation about updating the narrative surrounding support for development, especially in Canada.

Our main findings, for further discussion, are as follows:

1. Consistent with the broader literature, we find a positive and statistically significant association between Canadian exports and ODA. This does not suggest causality nor can we rule out reverse causation at this stage.

2. For a subset of Canadian ODA-recipient countries over the period 1989 to 2015, using an augmented gravity model, we find the elasticity of Canadian goods exports to gross ODA was 0.063% and statistically significant (at 0.01). The elasticity of exports to net ODA was 0.072% and statistically significant (at 0.01).

3. The average return over the period in question on a dollar in gross ODA was $1.10 in exports. The average return on a dollar of net ODA was $1.19 in exports.

4. These elasticities fall in range in between other recent findings, which have found much lower elasticities in the case of UK exports and aid, but much higher in the case of some EU member states.

5. ODA provision is not, by itself, a great use of public resources for donor export promotion. But then again, boosting donor exports is not the main aim of aid.

6. However, the effects do seem to suggest that in addition to the core moral and humanitarian purpose of aid, an added benefit over time may be that the same investment has the effect of boosting Canadian exports to aid recipient countries. We do, however, preface that neither causation nor the direction of causality is demonstrated conclusively by our work so far.

7. On the issue of reverse causation, as noted, we think the risk is low, given that a large share of exports is made up by countries that received a very small share of ODA.

8. In addition to standard robustness checks, we also checked for the effect of a few outsized countries. Two countries, China and Mexico, account for more than 50% of Canadian exports in the sample, but less than 5% of ODA. Therefore, unsurprisingly, removing China lowers elasticities.

9. We reiterate that the main purpose of foreign aid is and should be poverty reduction. However, according to our empirical results, which are reasonably consistent with others that have studied the same issues in different contexts, Canadian exports to ODA countries have been higher than they otherwise might have been, absent that same aid. In this sense, from an export perspective, Canadian ODA represents a high return on investment, given a $1 in ODA likely kept exports higher by between $1.10 and $1.19 without this being the main objective of development assistance.

10. The empirical literature is weak on the 'why' and 'how' questions, i.e. even if the positive relationship is accepted as meaningful, substantively speaking, and not merely in the statistical sense, *why* and *how* does a donor's aid affect its export performance in a partner country?

11. Goodwill, specific trade concessions, the impact of the presence of aid programs and workers acting indirectly as export promotors by increasing familiarity etc. may all be at play, as the literature suggests, but are hard to ascertain without deeper case studies.

12. Similarly, the impact of aid on recipient technological preferences and the dependencies they create may also be at work.

13. We also recognize that more general channels may be at play. Sustaining assistance at certain levels enhances living standards and has potential macroeconomic effects, such as via investment, productivity and growth. This can have the effect of raising demand, including for donor exports. This is an empirically addressable question and one that could be the subject of further research.

14. Our strategy is to drill down into the linkages by way of case studies, which will be an area of forthcoming work.

15. Descriptive data (see annex) point to some notable trends for Canadian exports and ODA over the study period: while exports are highly concentrated in a few developing country markets, ODA is much more dispersed. While the list of top export destinations shows little change over time—most of the largest in 2015 were also among the largest in 1989—implying the largest destinations were also the fastest growing. In the case of ODA, the list has changed markedly.

16. In many countries, exports increased substantially commensurate with a substantial decline in Canadian ODA: China, Brazil, India, Mexico. In others, exports increased while aid remained steady or also increased: Bangladesh, Colombia, Indonesia, Peru, Ghana, Kenya, Philippines and Vietnam are examples.

17. We provide a descriptive analysis of the sector/product level drivers of Canadian exports to ODA countries in the annex. Our analysis shows that the composition of exports to ODA countries differs significantly from that of Canadian exports overall, for e.g. agriculture and agri-food as a sector is one of the largest from the perspective of exports to ODA countries, more so than its share in Canadian exports overall. While the opposite is the case for e.g. for the minerals and fuels sector.

18. Taking into account the revealed comparative advantage (RCA) of Canadian exports and corresponding developing country demand, agriculture and agri-food stands out as a key sector of Canadian export competitiveness.

19. Furthermore, taking into account Canada's trade promotion priorities, in addition to ag and agri-food, high-tech, high-value and 'sunrise' sectors (e.g. clean technologies) are key priorities.

20. Given the link between Canadian strengths in these areas and developing country demand and needs is not well articulated from either a development policy or trade and investment policy perspective, we believe there are opportunities to better link trade and development strategies in a manner that is a 'win-win-win' for development impact, Canada's international priorities and future trade and investment diversification.

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Annexes

Annex 1 - Tied Aid in a Comparative Perspective

Figure 1: ODA by Tying Status, 2015

% UNTIED, 2015

Country	%
NORWAY	100.0
UNITED...	100.0
IRELAND	100.0
ICELAND	100.0
DENMARK	100.0
AUSTRALIA	100.0
LUXEMBOURG	98.8
CANADA	98.5
BELGIUM	96.7
FRANCE	95.6
ITALY	95.1
SWITZERLAND	94.6
NETHERLANDS	92.7
FINLAND	92.6
SWEDEN	86.8
NEW ZEALAND	84.7
GERMANY	84.0
SPAIN	80.8
TOTAL DAC	78.1
JAPAN	74.6
UNITED STATES	55.5
KOREA	50.2
PORTUGAL	49.0
SLOVAK...	47.5
CZECH...	44.3
AUSTRIA	36.4
POLAND	33.6
GREECE	14.5
SLOVENIA	12.4

Source: OECD DAC

Descriptive Analysis

Aid is considered "tied" when a condition for its disbursement to a partner country is that the proceeds can only be used to buy goods and services from the donor country providing the assistance. Tied aid has been shown to be less effective from a development perspective, and moreover goes against country ownership which is a key principle in aid effectiveness since at least the Paris and Accra rounds. Over the course of the past two decades especially, aid has become progressively more "untied". Canadian ODA is approx. 98.5% untied. Higher than the DAC average of only 78%. The DAC average is brought down by key larger ODA providers whose tying status remains high—approx. 25% of Japanese ODA remains tied, approx. of US ODA remains tied.

Annex 2 - Total Canadian Exports and ODA in the Econometric Analysis

Figure 2: Total Exports, by Country in the Sample
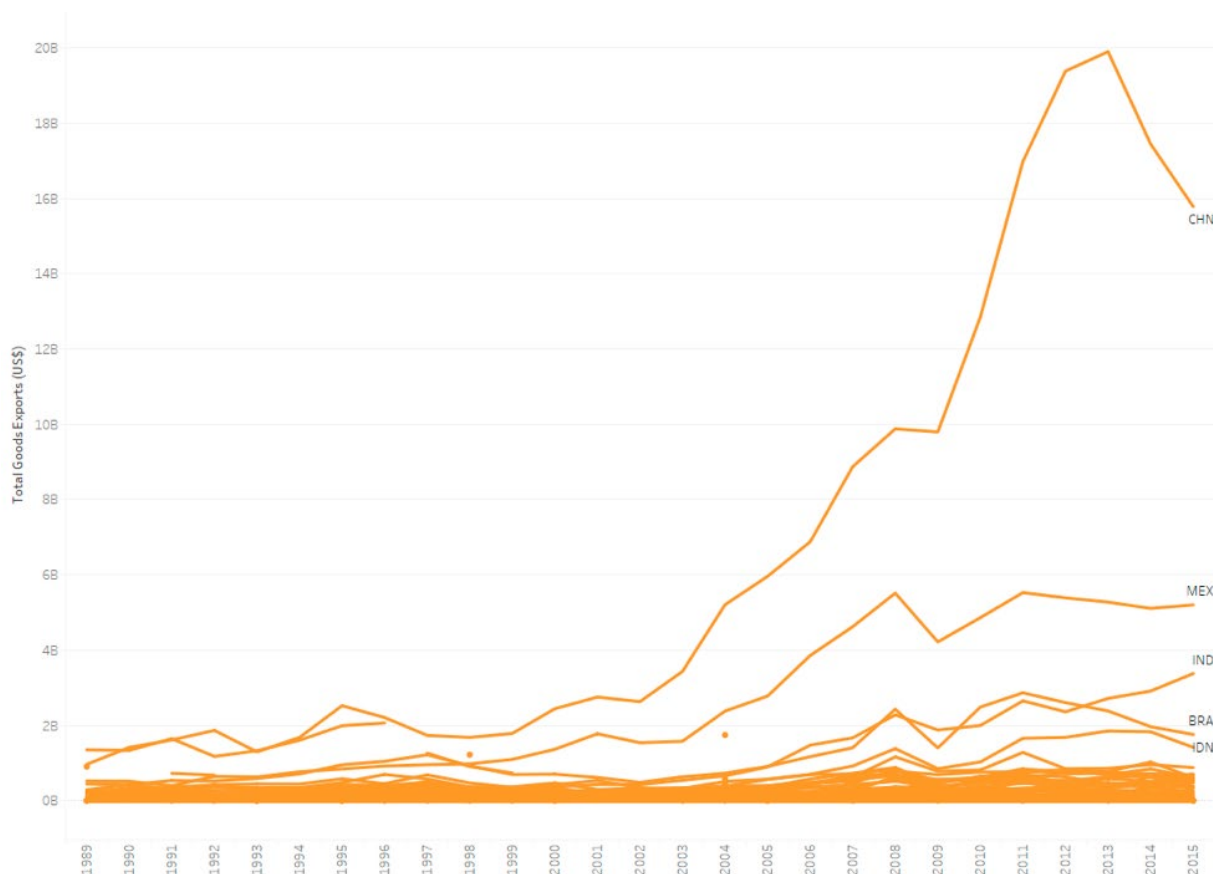

Source: UN Comtrade

Descriptive Analysis

It should be noted at the outset that Canadian exports under contention here, i.e. to the subset of ODA-recipients, value only $41billion (in 2015) or approximately 10% of total Canadian exports. That said, the subset does include 2 of the top 5 Canadian export markets—China (2nd) and Mexico (5th)—and 4 of the top 10—India (6th) and Korea (7th, the last year Korea is in the sample was 2004).

5 export markets—China, Mexico, India, Brazil and Indonesia—accounted for 67% of Canadian exports to this subset in 2015. These 5 (and Chile) are the only $1billion+ export markets for Canada in the sample. In 2015, there were 11 other export markets in the $500million to $1billion range, and 16 others in the $100million to $500million range. In 2015, there were 32 countries in this subset that were $100million+ export markets out of a total of 116 countries.

There is relative similarity in the list of export destinations between the start and end period, i.e. some of the largest back in 1989 were the largest even in 2015, reflecting the fact that among major export destinations, the largest have also been some of the fastest growing. Korea, China, Hong Kong, Mexico and Brazil were the top 5 in 1989, and three of these destinations were also among the top 5 in 2015.

The fastest growing export destinations that are at least $100million+ in size in order of relative growth rate include: China, India, Mexico, Turkey, Indonesia, Brazil and Colombia; and range between 11.3% and 5% CAGR (which is very rapid growth over such a long period). Several of these are, or have been, development assistance priorities.

Figure 3: Gross Canadian ODA, by Country in the Sample
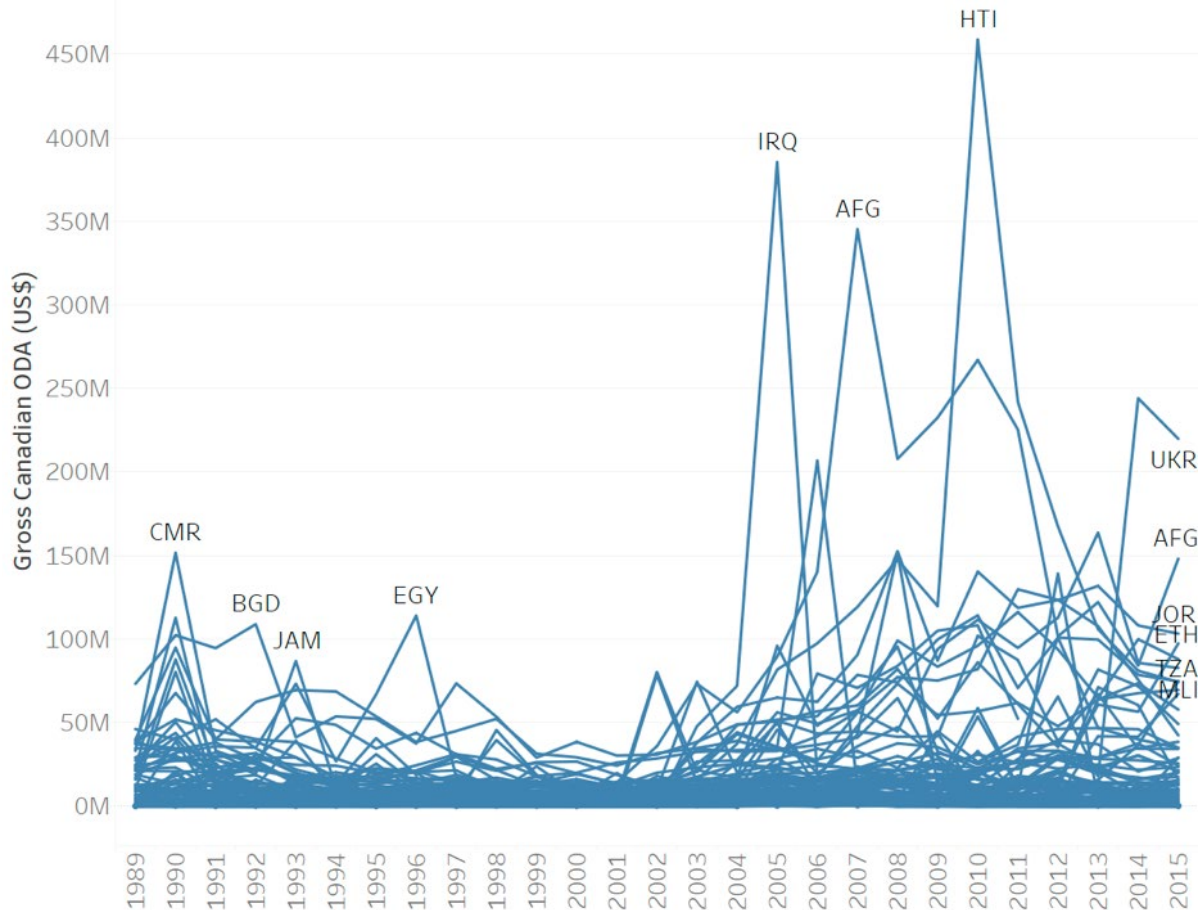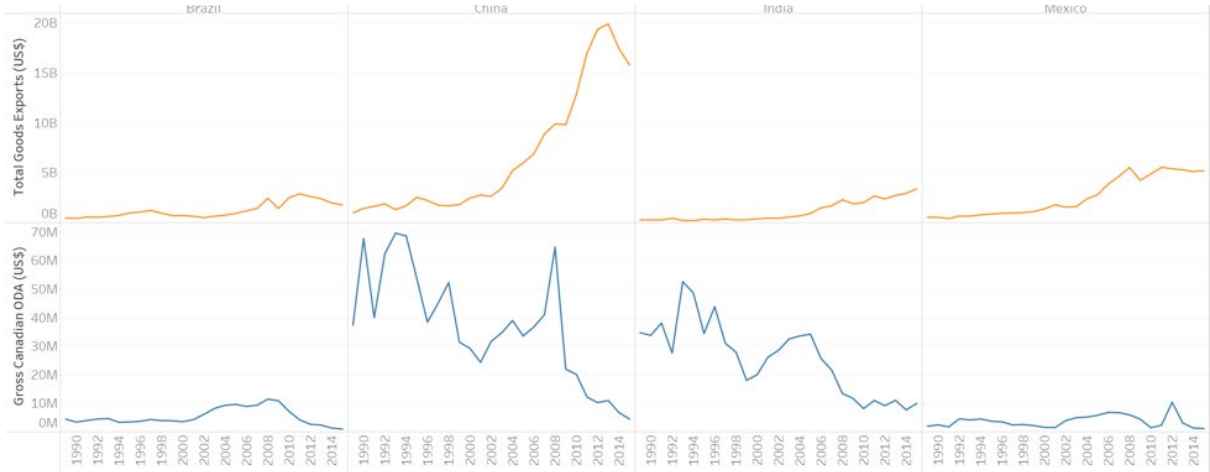

Source: OECD DAC

Descriptive Analysis

Gross ODA in the sample—by definition, given the nature of the analysis—focuses on ODA that is country specified (largely bilateral, or multilateral only where earmarked). Multi-country, multilateral or country unspecified ODA is not included. Total gross Canadian ODA for 2015 was approx. $1.9billion. This equates to approx. 45% of total ODA in 2015.

Gross ODA is less concentrated in a few countries (compared to the level of concentration of exports), but a key factor in the trend is high peaks for certain countries and year on year volatility.

Unlike in the case of exports, there is far more change in the list of ODA countries. The top recipients in 2015, in order, include: Ukraine, Afghanistan, Ethiopia, Jordan, Mali, Tanzania, Iraq, Ghana, Haiti and Syria. In 1989, the list was quite different: Bangladesh, Pakistan, Ghana, Jamaica, Indonesia, China, Tanzania, India, Cameroon and Morocco. Only 2 out of the top 10 from 1989 were among the top in 2015.

Figure 4: Examples of Countries Where Exports Increased Substantially and ODA Declined Substantially

Source: UN Comtrade and OECD DAC

Figure 5: Examples of Countries Where Exports Increased Substantially and ODA Remained Steady or Increased
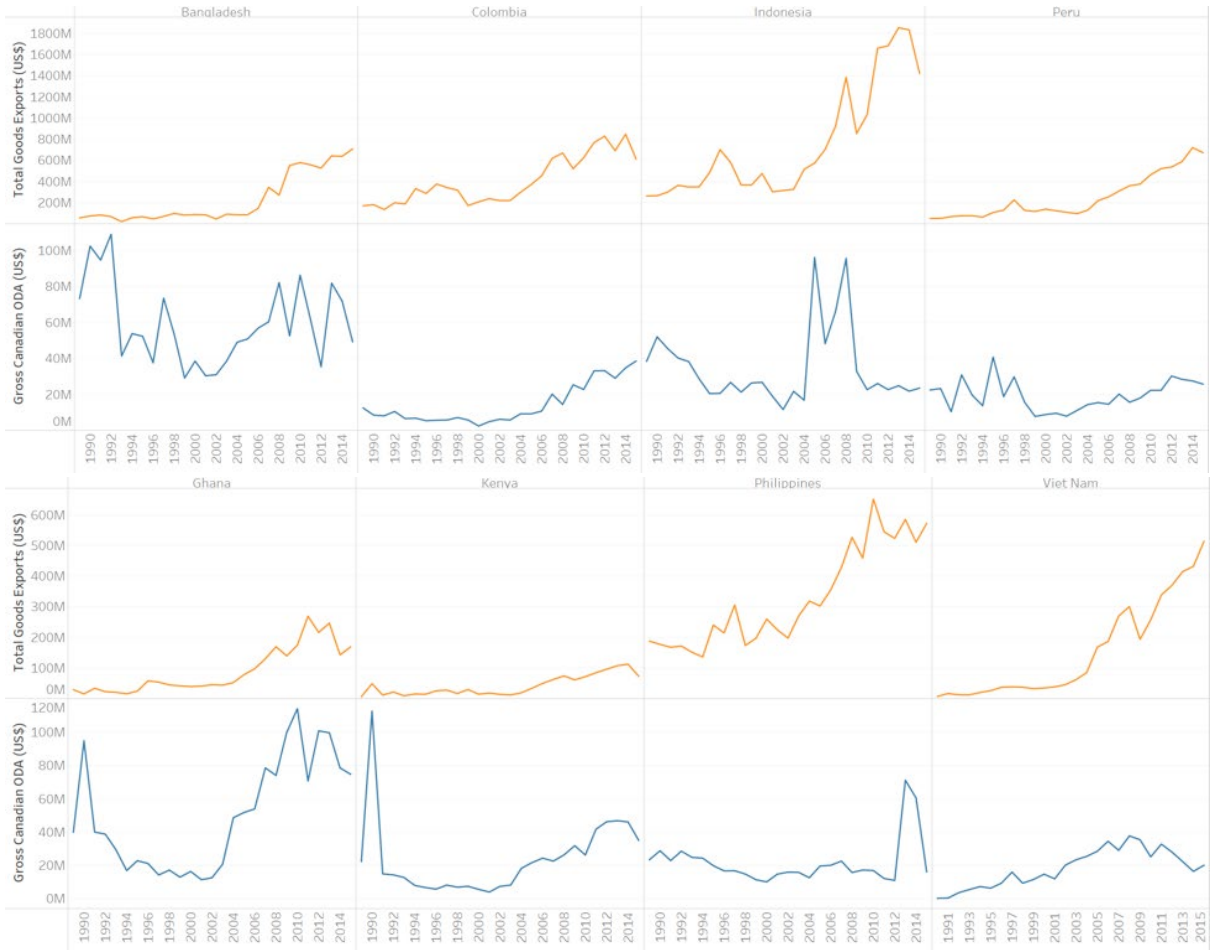
Source: UN Comtrade and OECD DAC

Annex 3 - Canadian Export Trends; Composition of Exports by Sector/ Products Using Various Classifications; Revealed Comparative Advantage (RCA) of Canadian Exports; and Trade Promotion by Sector and Country

Figure 6: Canadian Export Trends (1989-2015)
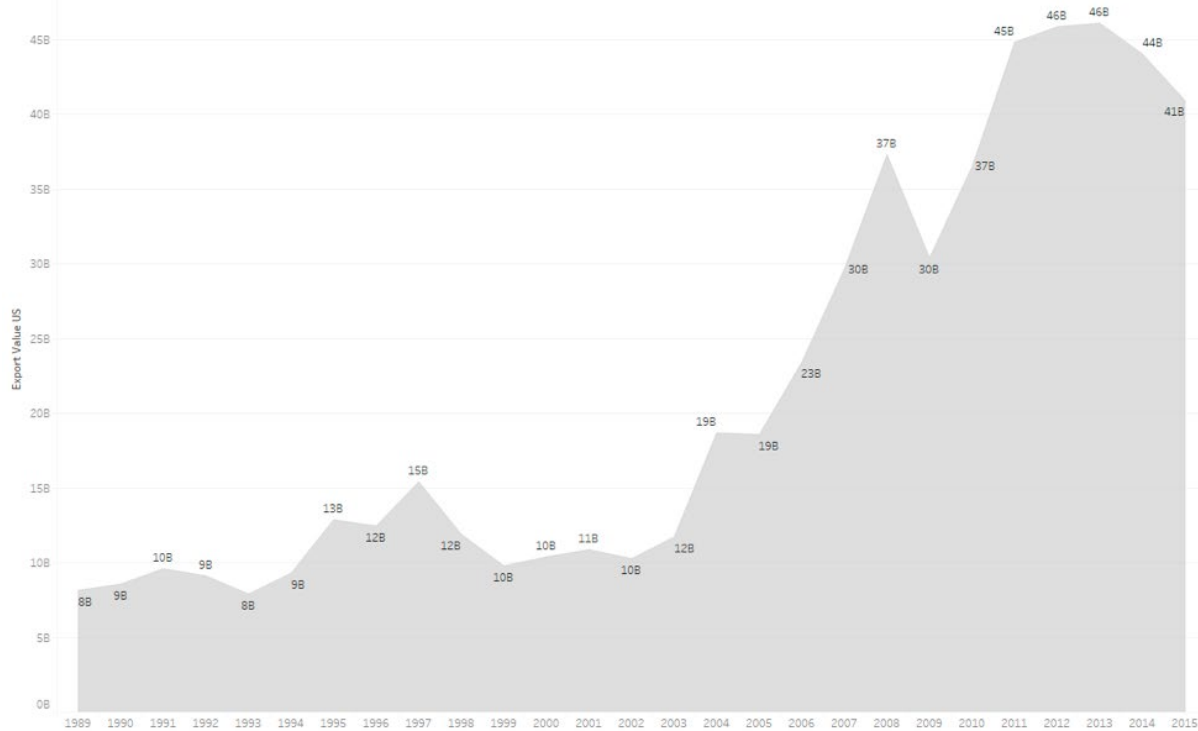
Source: UN Comtrade

Figure 7: Composition of Canadian Exports to ODA Recipient Countries, by HS2 (Overall and Percentage Share)
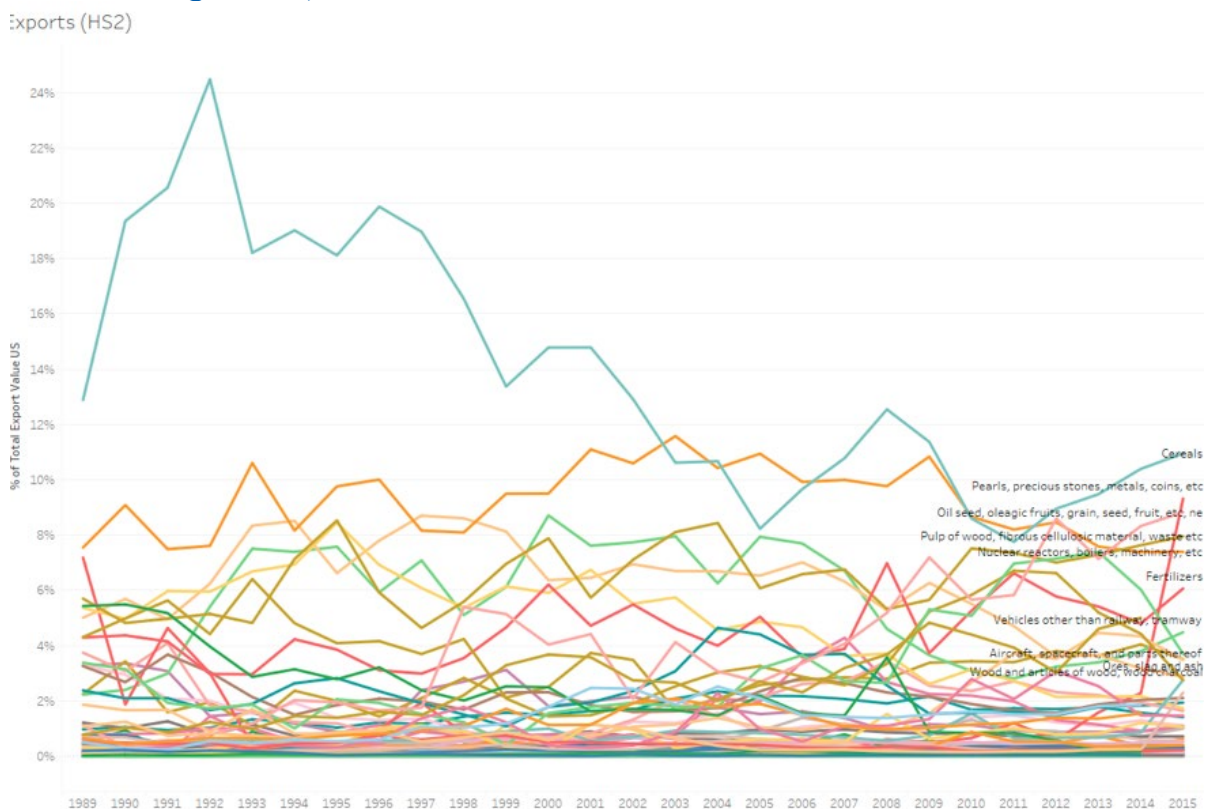
Source: UN Comtrade

Figure 8: Composition of Canadian Exports to ODA Recipient Countries, by CES (Percent and Value)

Figure 9: Composition of Exports to ODA Countries (Regrouped, Based on WITS Classification), Percentage Shares

Table 3: Canadian Exports, Export Shares and Revealed Comparative Advantage, 2015 (Exports to All Countries)

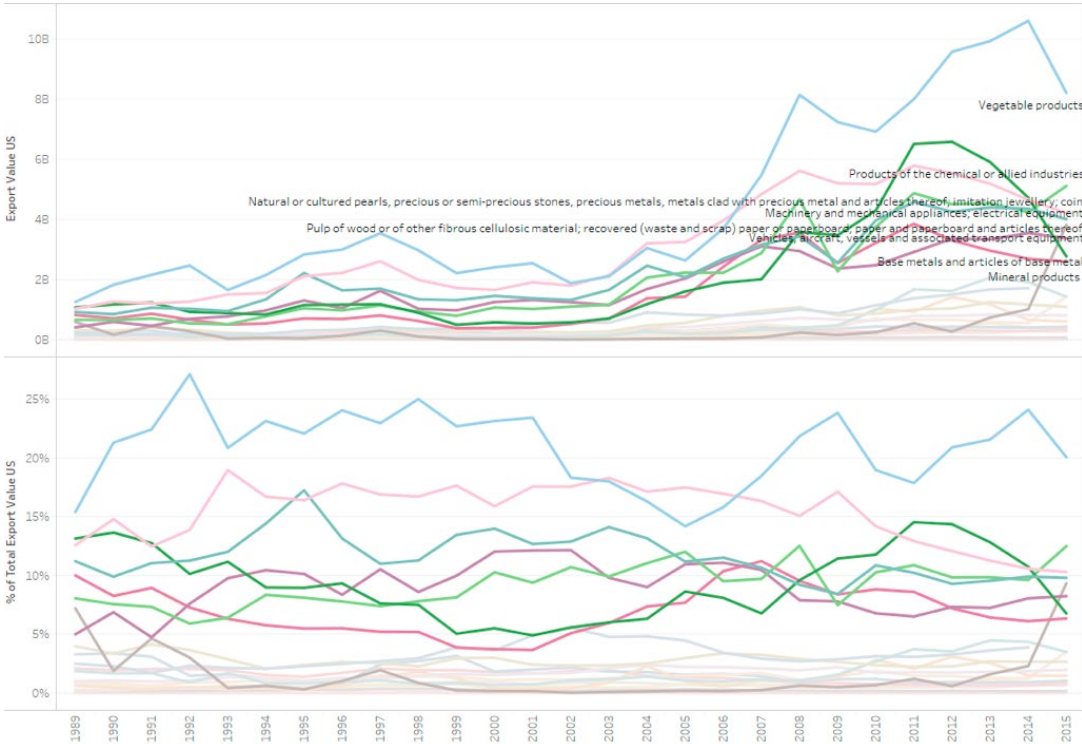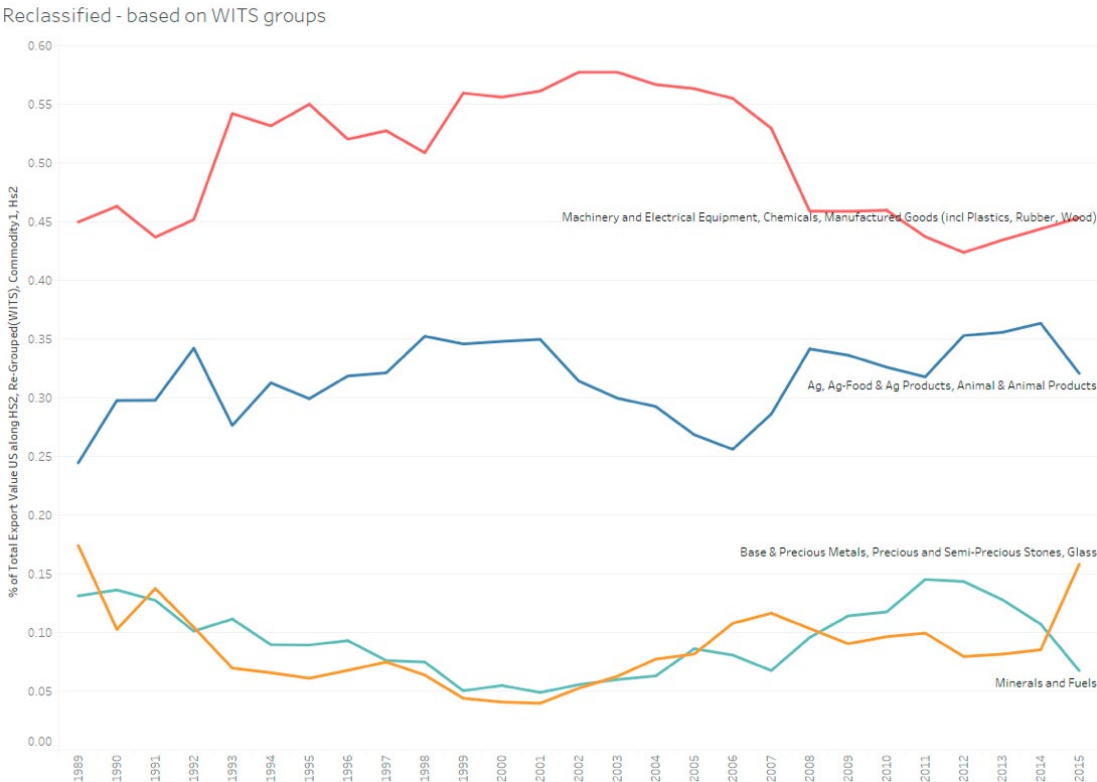## Exports, Shares(%) and RCA - by Stage of Processing

	Export (US$ Thousand)	Export Product Share (%)	Revealed comparative advantage
All Products	408,803,979	100	1.00
Consumer goods	117,368,835	29	0.93
Intermediate goods	103,633,795	25	1.20
Raw materials	94,745,083	23	1.87
Capital goods	73,470,652	18	0.52

Exports, Shares(%), and RCA - by Product Groups

Product Group	Export (US$ Thousand)	Export Product Share (%)	Revealed comparative advantage
Animal	11,246,746	2.75	1.47
Chemicals	27,873,127	6.82	0.77
Food Products	12,469,930	3.05	0.98
Footwear	407,086	0.10	0.04
Fuels	77,597,502	18.98	1.69
Hides and Skins	1,249,487	0.31	0.38
Mach and Elec	44,293,215	10.83	0.38
Metals	30,064,102	7.35	1.08
Minerals	7,921,857	1.94	1.31
Miscellaneous	32,099,077	7.85	1.02
Plastic or Rubber	15,765,897	3.86	0.89
Stone and Glass	19,644,124	4.81	1.04
Textiles and Clothing	3,127,069	0.76	0.16
Transportation	73,303,801	17.93	1.77
Vegetable	24,249,799	5.93	1.64
Wood	27,491,159	6.72	2.85

Source: WITS

Figure 10: Trade Promotion - Canadian Trade Commissioner Service (TCS) Personnel, by Country and Sector
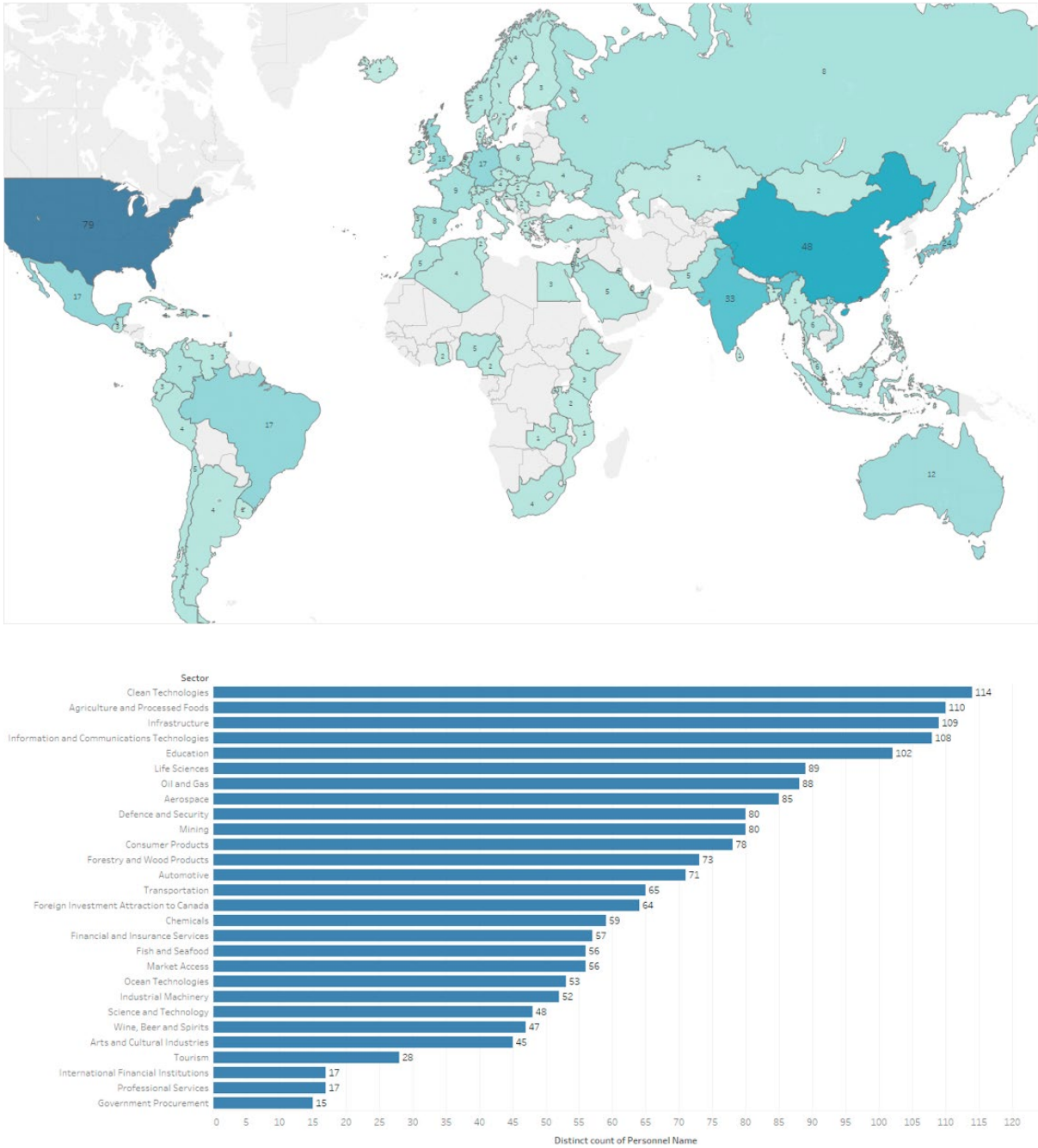
Source: Canadian Trade Commissioner Service

Individual personnel can be responsible for more than one sector, which is why personnel by sector is higher than the total number of personnel. Grouping by sector, however, provides a sense of the level of importance given to each in terms of trade promotion.

Descriptive Analysis: What are the Sector/Product Drivers of Canadian Exports to ODA Countries?

Figures 7, 8, and 9 provide data on Canadian exports to ODA countries by products/ sectors, using various classifications and levels. Figure 6 provides the total trend of exports from 1989 to 2015. Total exports from 1989 to 2002 were relatively flat, from a low of $8 billion a year to high of $15 billion a year. Part of this is explained by the impact of the East Asian crisis of the late 1990s (and to a lesser extent the dot-com crisis of the early 2000s). After 2002 Canadian exports to ODA countries took off significantly, rising to the $46 billion level by 2012. Figure 7 provides a breakdown of exports at the HS2 level. The largest individual product area at HS2 remains cereals, however its share has declined, from around 25% of total exports in the early 1990s to 10% by 2015. Oil seeds, precious metals and stones, wood products and fertilizers make up the other major export sectors.

As HS2 is still around 99 product areas, we reclassify and present the data, for easier understanding, by the Canadian Export Sectors classification system (which re-groups HS into 21 sections). At this level, vegetable products, products of chemical or allied industries, machinery and electrical equipment (manufacturing), pulp of wood and wood products, and precious metals and stones, show up as the main sectors of Canadian exports to ODA countries.

A further, higher order classification, is that using the World Integrated Trade Solution (WITS) approach. Manufactured goods—in this case machinery, electric equipment, grouped together with other manufacturing such as wood products, chemicals, plastics and rubber—is the largest aggregate category, followed by agricultural and agri-food exports.

Looking across the data at various levels, agricultural products (including certain related manufactured goods like fertilizers) and agri-food (vegetable products, fruits, grains etc.), is the largest sector of Canadian exports to ODA countries. This group makes up a far larger share of exports to ODA countries (25% to 35%) as compared to its share in Canadian exports overall (10% to 15%). It is also noteworthy that minerals and fuels make up a far smaller share of Canadian exports to ODA countries (around 6%) compared to Canadian exports overall (over 20%).

Five points stand out from our descriptive analysis at the sector/product level:

1. The composition of Canadian exports to ODA countries (i.e. developing and emerging economies including some of the poorer lower income countries and 'frontier markets') differs significantly from that of Canadian exports overall.

2. Agriculture and agri-food exports make up a far larger share of exports to ODA countries compared to Canadian exports overall, while minerals and fuels make up a far smaller share compared to Canadian exports overall.

3. Analysis of Canadian exports from a 'revealed comparative advantage' (RCA) perspective shows that Canadian exports are globally competitive in key high demand areas from the perspective of emerging and developing economies. The key sector that stands out in this regard is again agriculture and agri-food.

4. In addition to agriculture and agri-food, from a trade promotion perspective, while Canada's presence in developing countries outside of China, India, Brazil (and a few others like Indonesia, Morocco and Thailand) is relatively small, other key sectors that are important from a forward-looking perspective include – clean technologies,[4] information and communications technologies , education and life sciences.

5. High-tech, high value and 'sunrise' sectors are a key priority from the perspective of Canada's trade promotion. There are more opportunities from the perspective of developing country demand and need, and therefore opportunities to better link trade and development strategies in a manner that is a 'win-win-win' for development impact, Canada's international priorities and future trade and investment.

Annex 4 - Extended Specifications, Diagnostic and Robustness Checks

Table 4: Extended Specifications With and Without China and Mexico

VARIABLES	(1) Gross ODA	(2) Net ODA	(3) No China	(4) No Mexico	(5) No China & Mexico	(6) No China	(7) No Mexico	(8) No China & Mexico
lnCadGrsODA	0.0636***		0.0439***	0.0730***	0.0563***			
	(0.0177)		(0.0166)	(0.0173)	(0.0161)			
lnCadNetODA		0.0723***				0.0491***	0.0841***	0.0637***
		(0.0183)				(0.0162)	(0.0180)	(0.0156)
lnGDP_CA	-0.0779	-0.0678	-0.0385	-0.219***	-0.189***	-0.0209	-0.242***	-0.195***
	(0.0612)	(0.0637)	(0.0580)	(0.0619)	(0.0555)	(0.0612)	(0.0626)	(0.0586)
lnGDPj	1.033***	0.959***	1.007***	1.061***	1.022***	0.979***	0.990***	0.999***
	(0.0318)	(0.0323)	(0.0242)	(0.0306)	(0.0221)	(0.0254)	(0.0308)	(0.0237)
lnDist	-0.360***	-0.416***	-0.483***	-0.379***	-0.399***	-0.489***	-0.448***	-0.447***
	(0.0577)	(0.0603)	(0.0598)	(0.0654)	(0.0681)	(0.0606)	(0.0666)	(0.0715)
FTA_WTO	0.270***	0.323***	0.383***	0.181**	0.171**	0.433***	0.273***	0.299***
	(0.0711)	(0.0754)	(0.0638)	(0.0766)	(0.0741)	(0.0633)	(0.0852)	(0.0703)
ComLeg	0.128**	0.103*	0.405***	0.140***	0.386***	0.396***	0.127**	0.383***
	(0.0539)	(0.0596)	(0.0524)	(0.0520)	(0.0517)	(0.0553)	(0.0580)	(0.0558)
lnPop_j	-0.0799**	-0.0338	-0.172***	-0.104***	-0.202***	-0.152***	-0.0635*	-0.179***
	(0.0353)	(0.0363)	(0.0274)	(0.0342)	(0.0268)	(0.0288)	(0.0349)	(0.0283)
Constant	-2.312	0.513	-1.109	1.032	1.838	-0.305	4.941***	3.715**
	(1.658)	(1.641)	(1.535)	(1.791)	(1.657)	(1.505)	(1.735)	(1.617)
Observations	3,218	3,078	3,191	3,191	3,164	3,056	3,051	3,029
R-squared	0.926	0.877	0.851	0.925	0.796	0.863	0.863	0.804

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * <0.1

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[4] Which we construe broadly to also include emerging areas like machine learning, AI, and other related sectors, wherein Canada possesses early mover advantages, and which are likely to be significant future drivers of international trade and investment.

Diagnostic and Robustness Checks

Table 5: Diagnostics Testing (for Review Process Reference)

Test	Result	Interpretation
Hausman	Prob > chi2 = 0.00, reject Ho	Use fixed effects
Modified Wald Test	Prob > chi2 = 0.00, reject Ho	Presence of heteroscedasticity
Testparm – time fixed effects	Prob > F = 0.9999, fail to reject Ho	No time fixed-effects
Breusch and Pagan Lagrangian multiplier test for random effects	Prob > chi2 = 0.00, reject Ho	Significant differences across countries, can't use OLS, use RE
Wooldridge autocorrelation in Panel Data	Prob > F = 0.00, reject Ho	First order autocorrelation
Stationarity /Unit Root	P-value = 0.00, reject Ho	At least one panel is stationary
OLS – omitted variables	Prob > F = 0.00, reject Ho	Model has omitted variables
VIF	No vif > 10	Multicollinearity is low
Collinearity Diagnostics	R2 <0.45	No multicollinearity detected

Table 6: Explanatory Variables Testing

Explanatory Variables	ODA Countries	Non-ODA
Common official language	Insignificant	positive significant , not significant with comleg
Common ethnic language (>9%)	insignificant	positive significant
Common legal	Insignificant	positive significant
Common religion	Negative significant, Comlang ethno lost significance	
ODA	Positive significant	
FTA-WTO	Positive significant	
EU member	Can't run them together	Negative significant
Population	Insignificant	Positive Significant
GDP per capita	Positive significant (replacing gdp and population to avoid multicollinearity) 0.73	Positive significant (replacing gdp and population to avoid multicollinearity) 0.79
The various Entry measurements reduced the number of observations by half		
Entry cost - % of GNI percapita	Small Negative significant	Insignificant
Entry procedure – # of start up procedure to start a business	Negative significant	Negative significant
Entry time – days required to start a business	Negative significant	Negative significant
Entry time and procedure = days and procedures to start a business	Negative significant	Negative significant

Annex 5 - Summary of Relevant Studies and Their Findings

Table 7: Multi-Donor Studies

Study	Method/Approach	Donor	Elasticity of export to aid	Increase in Export per $1 aid	Other Findings
Multi-Donor Studies					
Nilsson (1997)	Gravity model with ODA variables	EU	0.23%	$2.6	
Wagner (2003)		1970 - 1990: 20 donors 1970 - 1992: Multiple donors and recipients	1970 - 1990: 0.062 -0.195 1970 - 1992: 0.33	1970 - 1990: $0.73 - $2.29	
Massa and te Velde (2009)	Aim to identify differences in the effects of different types of aid on exports – grants vs. loans – using standard econometric approach.	1980 - 2006: 15 donors	0.017%		Grants tend to have a more distortionary effect, compared to loans.
Silva and Nelson (2012)	Panel data and econometric (regression).	1962 – 2000; All donors and recipients	0.024%		
Holland and te Velde (2012)	Simulation - use the National Institute Global Econometric Model (NiGEM) to simulate the effect of aid provided by the EC on EU exports.	2014-2020: EU		€51 billion of aid provided over the period 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)	NiGEM simulation.	Multi-donor	€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.		
Mendez-Parra and Willem te Velde (2017)	Gravity model with all variables in log form, for EC and EC member states.	EU and EU Member States	EU Aid: 0.007%-0.024%	EU Aid: $1.02 - $3.69 EU MS Aid: $0.19 - $2.29	They attribute the low elasticity to the fact that the positive effect of aid on exports is offset by changes in relative prices.

Table 8: Single Donor Studies

Study	Method/Approach	Donor	Elasticity of export to aid (increase in export per 1% increase of aid)	Increase in Export per $1 aid	Other Findings
			Single-Donor Studies		
Martínez-Zarzoso et al. (2008)	Similar gravity model, but only for one donor – Germany – i.e. effects on German exports generated by German aid.	Germany	0.08% - 0.13%	$1 - $1.5	
Nowak-Lhemann et al. (2009)	Econometric analysis of German aid and exports. Co-integration to investigate causal relationship.	Germany		1962-2005: $1.04 Short-term effect: $0.69	Exports are caused 'in the Granger sense' (Granger, 1969) by aid. This implies a unidirectional relationship between aid and exports in this case.
Martínez-Zarzoso, Nowak-Lehemann et al. (2016)	Gravity model on aggregate & sectoral export. Input-output analysis for employment	Germany	1978-2011 Long-run aggregate: 0.062% Sectoral: 0.10%-0.24%	$0.83	Aid-induced gains in sectoral exports are associated with the gross employment of approximately 216,000 people
Martínez-Zarzoso et al. (2013a)	Gravity model	Netherlands	1973-1999: 0.034%	1973-1999: $0.29	
Fic et al. (2014)	NiGEM simulation	Netherlands	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%.		
Mendez-Parra and Willem te Velde (2017a)	Gravity model	United Kingdom		$0.22	In 2014, $5.9 billion in UK direct bilateral aid increased UK exports by almost $1.3 billion

Table 9: Other Studies

Study	Method/Approach	Main Findings
Djajic et al. (2004)		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.
Arvin and Baum (1997), Arvin and Choudhry (1997) and Arvin et al. (2000). Moons and van Bergeijk (2011).	Exports may be the main channel of effect on donors of aid provision, in part because until the 1990s about 50% of donor aid was tied to exports. These studies, econometrically, isolate the impact of tying.	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 an embassy or consulate in the recipient country and the celebration of trade missions.
Trap (2012)		Sustaining development assistance at certain levels can enhance living standards in recipient countries.
Massa et al. (2016)		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.

Adapted substantially by authors from Mendez-Parra and Willem te Velde (2017).