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# **The Impact of the Crisis on Trade and the role of Regional Integration**

**Michael Gasiorek**

(CARIS, University of Sussex)

**&**

**Sarah Ollerenshaw**

(CARIS, University of Sussex)

## **Abstract**

This paper builds upon the existing literature which identifies the possible role of the level and composition of demand, the composition of supply, changes in protection and access to trade credit as explanatory factors for the dramatic decline in trade. In this paper we focus on each of the above and on the role of Regional Trading Agreements during the crisis. In comparison to the existing literature we work with monthly data in a multi-country context. There are a number of clear and consistent messages that emerge. First, we find that changes in demand (economic activity) did indeed negatively impact on trade, but by less than previously suggest authors. Secondly, changes in trade credit impacted negatively on trade flows; as did the introduction of bilateral protectionist measures. Fourthly, we find that compositional effects were also important. Finally and with regard to each of the above we find consistent evidence that countries who belonged to a regional trading agreement, and in particular between high income countries experienced a bigger decline in trade, and where the role of the composition of trade was also more significant.

## 1. Introduction

As has been well documented the financial and subsequent economic crisis triggered by the collapse of Lehman brothers in September 2008, was also associated with a substantial decline in international trade. The fall in GDP ranged quite widely but with some countries experiencing declines in excess of 10%, while the fall in world trade in nominal terms was 24.71%. As has been well documented both in real and nominal terms the decline in trade was considerably greater than the decline in GDP (OECD, 2010, Levchenko, 2010). This in turn has stimulated a literature on attempting to identify the key causal factors behind this decline and also the extent to which the decline was significantly larger than in previous recessions.

There have been a number of papers exploring this collapse in trade and focussing on the underlying mechanisms driving that fall. The literature proposes various possible explanations for that decline in trade, of which there are six key explanations that can be identified. These include: (i) the fall in global demand; (ii) a drop in the price of traded goods; (iii) a greater impact of the decline in demand on tradeables as opposed to non-tradeables; (iv) vertical specialisation / outsourcing which served to magnify the impact on trade; (v) the impact on credit and in particular trade credit; (vi) a rise in protectionism.

The existing literature typically focuses either on the individual countries such as the US (Alessandria et.al, 2010; Chor and Manova, 2010; Levchenko et. al, 2010a, 2010b; ), Japan (Amiti & Weinstein, 2009), or Belgium (Behrens et.al, 2010); is based on survey / descriptive data (Asmundsen et.al, 2009; Morel, 2009; Chauffour and Farole, 2009; Mora and Powers, 2010); or on the simulation of computable equilibrium models (Quere et.al, 2009; Eaton et.a. 2011). There are also papers that draw lessons from the crisis by looking more longer term at the relationship between trade and economic activity (Freund, 2009; Abiad et.al 2011).

In this paper we are interested in exploring a number of the key issues identified above, but where we also want to identify where there is any evidence that the impact on trade, and the factors driving that impact, differed across countries. In particular we are interested in examining the role of regional trading agreements, and in the role of the real income level. Each of these pose interesting questions, but which to date have not been addressed at all in the literature. One could suppose, for example, that countries who are members of an RTA might experience a smaller decline in trade. This could occur because of the greater coordination of associated fiscal stimulus measures and macro-economic policy, it could occur because it may be easier to resist intra-union protectionist pressure, it could occur because of higher quality relationships between firms and their suppliers, or firms and banks resulting in a smaller contraction in trade credit. However, it is equally possible to tell an alternative story. Hence it is plausible that in an RTA, in particular where a greater extent of deeper integration has occurred, intermediate trade and vertical supply chains may be more important. If these are important in the collapse in trade (and see below for a longer discussion of this), then it could be that trade within regional agreements could see a bigger impact. Similarly, it is important to see whether the impact on trade may be different according to the level of development. The financial crisis originated in the US and was primarily focussed on certain advanced industrial economies. Is there any evidence then to

suggest that the collapse in trade was greater for these economies, or were the transmission mechanisms between countries such that developing economies were equally affected.

The empirical methodology we employ is that of gravity modelling, but as opposed to using annual data we use monthly trade data. This enables us to track the impact of the financial crisis at a very detailed temporal level, though with the consequence of a reduced country sample. We work with a sample of 37 countries, both developed and developing, for whom we have information both on bilateral trade and on industrial production. We also have data on bilateral protection levels (from the Global Trade Alerts dataset)<sup>1</sup>, on the composition of trade, and on credit risk (the Libor-OIS spread) which we use as a proxy for trade credit price and availability. This enables us to consider the role of each of the key explanatory factors raised in the literature, and in a multi-country framework.

## **2. Stylised Facts**

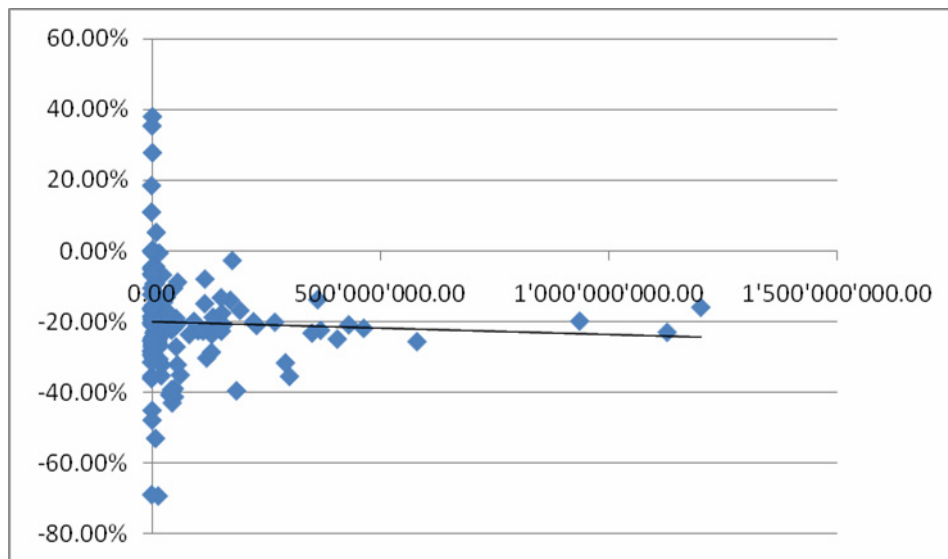
As discussed earlier, there are six key explanations which are typically discussed in the literature considering the decline in trade. Each of these has been the subject of some discussion and analysis. With regard to the fall in global demand it has been argued (e.g. OECD, 2009; Freund 2009; Alessandria et.al 2011) that while the decline in trade was large, relative to the fall in production or GDP the decline in trade is not significantly different to that experienced in previous recessions. The large absolute fall in trade can in good part be explained by the synchronicity across countries in the decline in demand and production (Imbs, 2009, OECD, 2009). Indeed it is now commonly recognised that the extent of the synchronised fall in demand is a key feature of this period in comparison to previous episodes. Much of the decline in trade can then be explained by changes in demand, and some authors argue that a GDP elasticity greater than one for the decline in trade is to be expected. Studies have also shown that the period also saw a significant decline in commodity prices which in nominal terms exacerbated the fall in trade. As opposed to arguing that the decline was not exceptionally large, Levchenko et.al (2010a) suggest that the decline was in fact significantly larger in relation to economic activity in comparison to previous recessions.

Closely related to this is work which argues that the large decline in trade can be explained primarily by compositional factors (OECD, 2009; Eaton et.al, 2011; Alessandria et.al, 2010). In broader terms it is argued that the impact of the decline in demand fell more heavily on tradeable goods as opposed to non-tradeables. Connected to this is the suggestion therefore that the impact on trade should have been larger on smaller open economies as tradeables form a more significant share of GDP. In Figure 1 below we explore this by plotting the correlation between the change in trade over 2007-08, against GDP. What is clear from this figure is that there is no positive correlation and that therefore *prima facie* it does not appear that the impact on trade would have been greater for smaller economies. This can also be seen from Figure 2 which gives the % change in exports for each of the countries in the sample used in this paper. Once again there appears to be little pattern by size of country.

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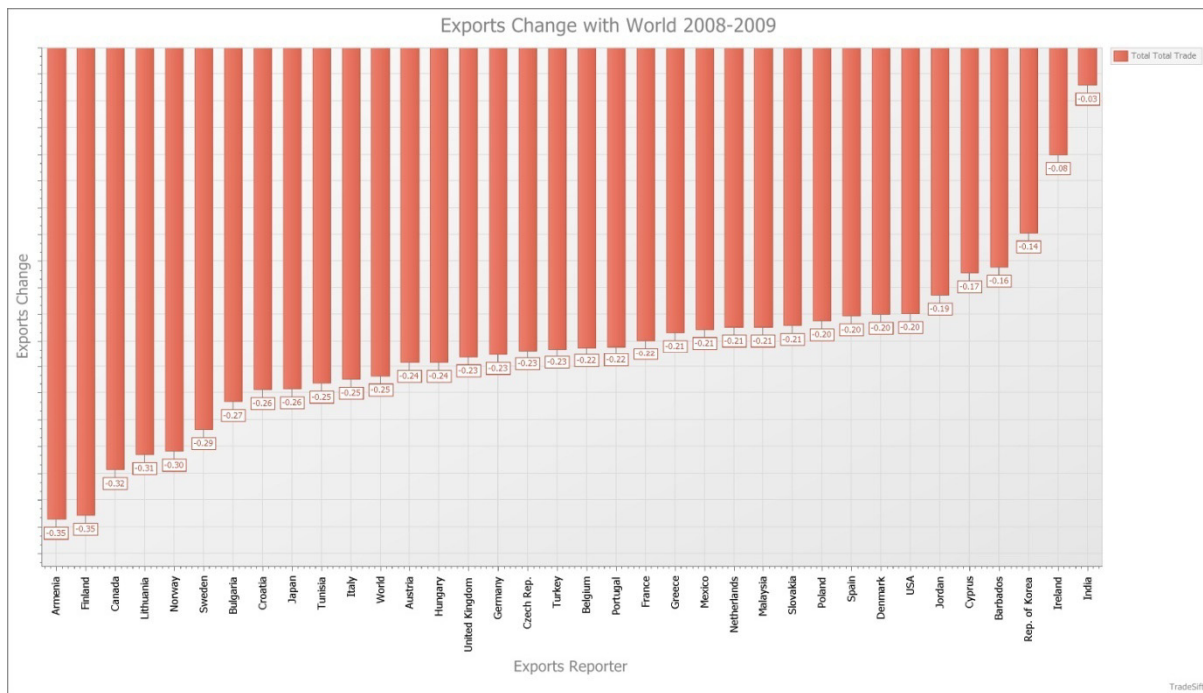
<sup>1</sup> See [tp://www.globaltradealert.org/](http://www.globaltradealert.org/)

**Figure 1: Correlation between levels of GDP and changes in trade**



Source: Comtrade

**Figure 2: % change in exports to the world 2008-2009**



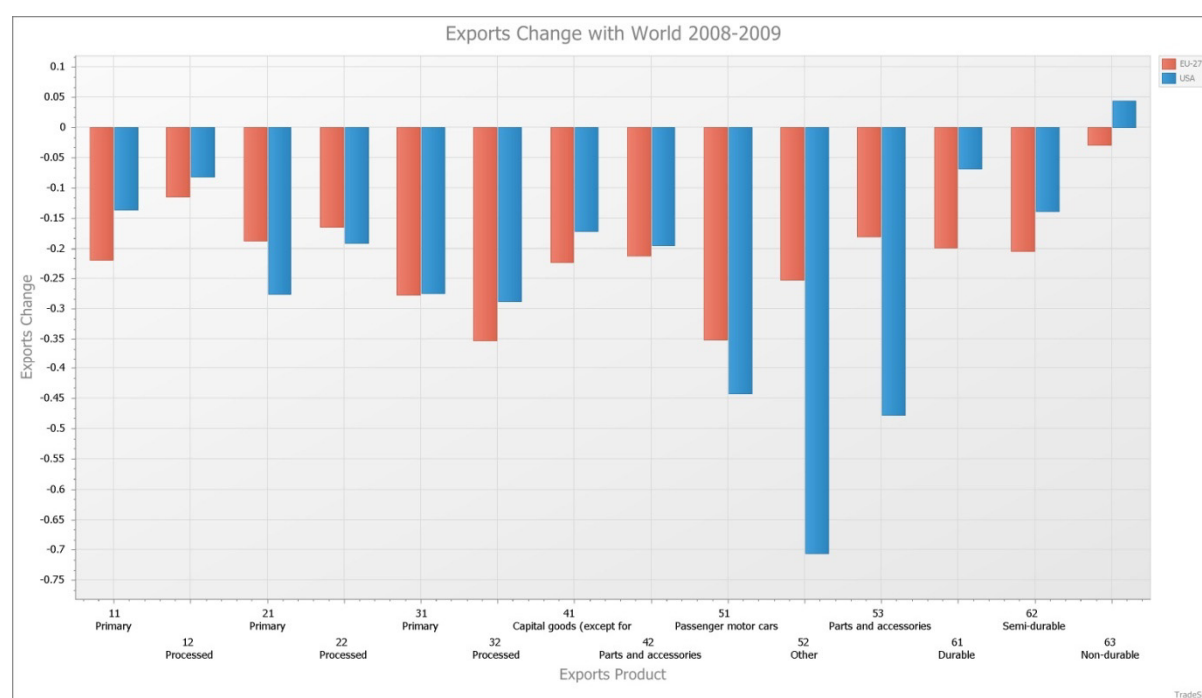
Source: Comtrade

More specifically one approach to the compositional effect explanation is that the decline in trade occurred because of a larger impact on manufactures than non-manufactures, especially as a result of a reduction in expenditure on consumer durables, possibly also because of a greater impact on capital goods, and finally also because of firm-level inventory adjustment. Hence in the face of uncertainty as a result of the collapse of Lehman and the financial crisis that ensued consumers forwent expenditure on durable goods; and producers (and/or retailers) drew down upon their inventories as opposed to keeping stocks

of these constant. For example, Alessandria et. a. provide detailed evidence for the US car industry in support of this hypothesis.

Once again the graph below provides some stylised evidence for this, as it depicts the percentage change in trade flows for the US and the EU by BEC category. As identified by previous authors for the US it is the decline in auto trade which is the most significant. This is less obviously the case for the EU, which also saw a big decline in trade in processed goods. For both the US and the EU the decline in consumer durables was less pronounced.

**Figure 3: Change in Exports for the US and the EU 2008-09 by BEC**



Source: Comtrade

Levchenko et.al. (2010a) provide a variant of this compositional approach and argue that there may be a greater decline as a result of the transmission of shocks through vertical production / supply chain linkages. The hypothesis here is that a drop in final output, leads to a decline in demand for intermediate inputs, which in turn leads to a disproportionate decline in trade flows. Hence with more closely integrated supply chains the trade effects get magnified. This explanation is strongly disputed by the OECD (2009), and by Quere et.al. (2009) each of which argue in some detail that this is not a possible explanation. In essence the argument goes that the vertical specialisation of trade increases the base level of trade (cf. Hummels et.al), and that from that base the decline in trade is no greater. Hence, just because industries may be vertically specialised, would not mean that the proportional decline in trade would be any bigger.

It is worth noting, however, that while the argument put forward by the OECD and Quere et. al. is correct, it is nevertheless possible for the decline in trade to be greater for vertically specialised industries. But for that to be the case additional assumptions would have to

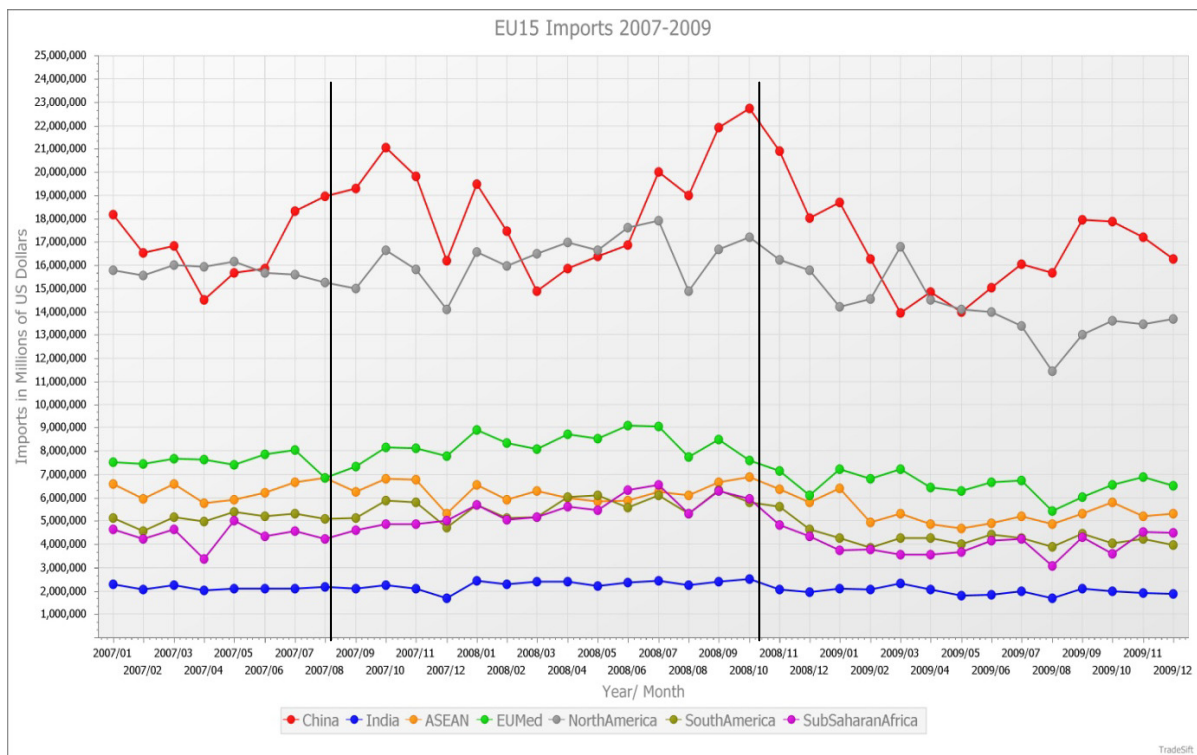
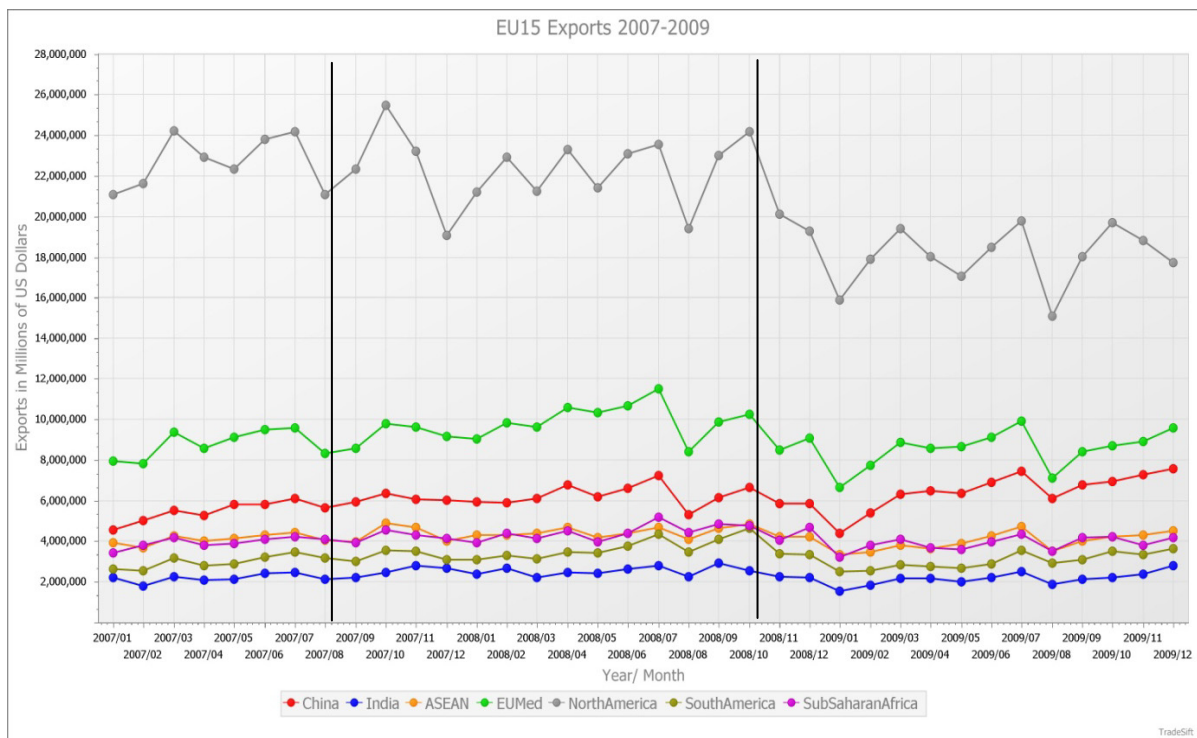
made; and here there are several possibilities. First that the elasticity of export demand to income would need to be greater for such industries, which could in turn be linked to the level of sophistication of the goods, with vertical specialisation being positively correlated with the sophistication of goods; and with more sophisticated goods being higher quality / luxury goods, which in turn tend to have a higher income elasticity of demand. A second explanation concerns changes in prices, and the way prices respond to the decline in demand. To the extent that non-vertically specialised goods are less differentiated it is perhaps more difficult for there to be much price adjustment as price cost margins are lower. Conversely, to the extent that vertically specialised goods are more differentiated, then producers may have more scope to lower prices. In addition if the good relies on imported intermediates there may be greater possibilities for substitution of cheaper intermediates from other sources, and also therefore greater possibilities for reducing prices. If this story is correct then it may be the case that more vertically specialised industries can reduce prices more easily. Price reductions lead to a bigger decline in the value of trade (though of course this also depends on the price elasticity of demand). So the value of trade may fall by more in vertically specialised industries.

Plausibly it may also be the case that that trade finance is more important in vertically specialised industries hence leading to a bigger decline in trade in these industries (see for example Klapper & Randall, 2010). This could be for two reasons. First, if each trade transaction is impacted upon, the more trade transactions there are the bigger the impact. Secondly, if credit is restricted at one end of the value chain, this may impact on the availability of credit further up the chain – i.e. there may be knock on effects. Similarly the inventory adjustment story may also be consistent with explanations of the trade collapse, which focus on the impact of credit, as it could be that reductions in access to credit may have forced firms to adjust via inventories. If the arguments in the preceding two paragraphs are correct, this would mean that relative to GDP the fall in trade could be bigger between countries which are more vertically specialised – but not simply because of the cross-hauling of intermediates as seems to be commonly asserted, but because of more complicated dynamics.

This leads us to the role of trade credit. Here the suggestion is that it was changes in trade credit, which raised exporters or importers firms' costs and thus contributed to the decline in trade. Evidence on this is somewhat mixed. A number of papers (Mora and Powers, 2010; Levchenko et. al 2010a, 2010b; Asumundsen et.al, 2010; Morel, 2010) present evidence and argue that there is little or no support for this hypothesis. In contrast the OECD (2009) suggests some impact of trade finance, and more recently Chor and Manova (2010) using monthly import data for the US, and Amiti and Weinstein (2009), suggest the converse.

All of the preceding is also closely related to the possible role of regional trading agreements during the period of the crisis, and whether membership of an RTA was a significant factor. In order to shed some very preliminary light on this, the following two graphs detail the change in trade of the EU15 with selected country groupings, and where the vertical lines indicate the two key points of the crisis August 07 and Sep-Oct 08. If we first look at the change in EU exports we see that there is little evidence of any impact towards the early period of the crisis and that the big trade impact occurred after September 2008. The biggest impact by level of exports was to the United States, followed by the EU-Mediterranean countries (defined as the countries part of the Barcelona process).

**Figure 4: Monthly change in imports and exports for the EU with selected groupings**





In terms of percentage changes the average decline in EU exports in the final quarter of 2008 was just over 22%, with the largest percentage declines being with regard to India (23%), South America (18%) and North America (16%). When we look at the pattern of imports the levels and percentage changes are now significantly different. First, of all we see the greater importance of China in the EU's imports as opposed to exports. Secondly, the average decline in the EU's imports over this period was just under 22%, but the decline was largest with regard to Sub-Saharan Africa (31%) and the EUMed countries (28%). What these graphs therefore show is a strongly differential impact between imports and exports with regard to the patterns of trade impacted upon, and that while the crisis may have originated in the US and then UK, its impact on trade was considerably broader and by no means more significant for these economies, and which is also corroborated by Figure 2 above. All this calls for much closer econometric examination in order to disentangle the causal factors.

Finally, there has been some discussion of the possible role of protection in impacting on trade flows. Indeed, fears with regard to a possible rise in protectionism (fairly broadly defined) were much discussed in the immediate aftermath of the crisis, and the Global Trade Alerts mechanism was introduced precisely to monitor the possible spread of protectionism. A number of the GTA reports have subsequently identified where protectionism appeared to be on the rise. Empirically, however, to our knowledge, there has been little attempt to formally address whether any changes in protectionism have impacted on trade flows, and our paper is the first to do so.

#### 4. Methodology

The gravity model, first developed by Tinbergen (1962), Pöyhönen (1963) and Linnemann (1966), is widely used to explain trade bilateral trade flows in a range of contexts and has been significantly augmented over the years in order to deal with a variety of econometric issues, including zero trade flow, endogeneity, multilateral price indices, and sectoral level regressions. See with notable contributions from Anderson (1979) and Anderson and van Wincoop (2003).<sup>2</sup>

In this paper our specification of the gravity model is as follows:

$$\ln(M_{ijt}) = \alpha_{ij} + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \text{monthtrend} + \beta_4 \text{crisis}_{ijt} + \beta_5 \text{VG}_{ij} + \beta_6 \text{RTAs}_{ijt} + \beta_7 \text{NN}_{ijt} + \beta_8 \text{Crisis} + \beta_9 \text{Dshare} + \beta_{10} \text{Protection} + \text{fixed effects}_{it} + \text{month dummies} + u_{ijt}$$

Where,  $M_{ijt}$  gives the bilateral trade flow between countries  $i$  and  $j$  in period  $t$ , and where the periods represent months.  $Y_{it}$  and  $Y_{jt}$  are the monthly levels of production in the importer and exporter country respectively in period  $t$ . We then have a vector (VG) of traditional time-invariant gravity variables: distance, border, landlocked, common language, and common colony, and variables to capture regional trade agreements and the impact of the crisis. The error term can be written as:  $u_{ijt} = \mu_{ij} + v_{ijt}$ , with  $\mu_{ij}$  as the (fixed or random) unobserved bilateral effect and  $v_{ijt}$  as the remaining error.

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<sup>2</sup> See Egger (2002 and 2005) for a comprehensive discussion of alternative techniques to gravity modelling, Carrere (2006) on the modelling of regional trade agreements; and Andersen (2010) for a good review of the literature.

An important part of the identification strategy is related to the measurement of the crisis itself. Here we employ two complementary strategies. As has been well documented the start of the crisis is typically seen to have occurred in August 2007, with the main impact of the crisis coming after the collapse of Lehman brothers in October 2008. Given that we are dealing with a three year period, we can also see that the upturn in trade began in August 2009. In order to deal with this we create three “crisis” dummies – crisis beginning (crisis), crisis worsening (crisisW) and crisis end (crisisEnd). Each of these takes the value 0 prior to the date of commencement, and 1 subsequently. This can also be clearly seen in Figure 5. below. As a dummy variable, to some extent this is of course a somewhat crude measure of the crisis. It accurately identifies the key breaks in the time period under consideration, but of course it is possible that the variables could be also picking up on other factors. However, given the substantial observed changes in trade which are closely identified with specific events this is unlikely.

The second way in which we focus on the impact of the crisis is to focus directly on the rise in credit risk, measured by the Libor-OIS spread, as a proxy for the cost of trade credit. Trade finance facilitates some 80% to 90% of global trade valued at \$15 trillion in 2008, and the trade finance market has an estimated worth of \$12-13.5 trillion (Auboin, 2009b). The importance of trade finance was much discussed by policy makers during the crises, and trade credit is one of the key explanations discussed in the literature for the collapse in trade. For example the G20 London Summit in April 2009, focused on a substantial \$250bn injection into trade finance channels to ease liquidity, and a speech by former UK Minister for Trade (Gareth Thomas) “suggest(s) that up to £25 billion of lending could be withdrawn in 2009 as foreign banks retreat to their home markets.’<sup>3</sup> The following table outlines the various forms of trade financing options available, where the least secure form of financing is via open accounts, and the most secure cash in advance.

**Table 1: Forms of Trade Finance**

<i>Trade Basis</i>	Description	Characteristics	Potential Impacts of the Crisis
Open Account (OA)	Goods and services shipped before payment is due, usually 30-90 days later. Via: Export working capital, export credit insurance or export factoring	<ul style="list-style-type: none"> <li>- Low risk/well established trading relationships</li> <li>- Competitive markets</li> </ul>	
Trade Credit	Alternative to above with credit extended by the exporter rather than payment immediately on receipt of invoice		General shortage of credit in domestic markets may make this infeasible, even for larger- lower-risk exports

<sup>3</sup> London Chamber of Commerce and Industry, Gareth Thomas MP, London, 24 March. Accessed June 2009: <http://www.berr.gov.uk/aboutus/ministerialteam/Speeches/page50670.html>

Domestic bank lending	Provision of credit to cover costs pre-shipment/receipt of payment. Less risky given it is loaned against specific products		Restricted if domestic banks suffer from illiquid market conditions
Documentary Collections (DCs)	Exporter entrusts collection of payment to exporter's bank	<ul style="list-style-type: none"> <li>- Less complicated and less expensive than LCs</li> <li>- Established trading relationships</li> </ul>	
Letters of Credit (LCs)	Commitment by bank on behalf of buyer that payment will be made	<ul style="list-style-type: none"> <li>- New/less established trading relationships</li> <li>- Protects buyer since documents received confirming shipment before payment is made</li> </ul>	Banks withdraw credit/reduce exposure due to lack of funds or unwillingness to undertake increased risk. Also likely due to increased counter-party risk

A survey conducted in March 2009 (jointly commissioned by the IMF and the Bankers' Association for Trade and Finance (BAFT)) explores the opinion of forty-four banks world-wide, from twenty-three countries (fourteen of which are included in the sample of this research). The survey poses questions based on the difference in various conditions with respect to two time periods: October 2008 as compared to October 2007, and January 2009 as compared to October 2008. The findings are consistent with another survey conducted by the International Chamber of Commerce (IIC) (March 2009), which uses a larger sample of 122 banks from 59 countries which makes use of SWIFT trade volume statistics, and therefore does not have information on the value of the trade, or the price of such trade instruments, but do provide a good indication of changes in usage of LCs<sup>4</sup>.

Three aspects are relevant and should be distinguished in the discussion of trade finance: the value, the number and the price of trade finance products utilised. A key finding of the IMF-BAFT survey is a marked decline in the *value* of trade finance business, which accelerated in the period October 2008 through January 2009, and was evident in almost all regions (comprised of the twenty-three country sample): the largest impact affecting industrialised countries with a change of 26% in banks reporting a decline; followed by Latin America and South Asia, both reporting 19% changes. The decline was most significant for LCs with an 11% decline in value for the period October 2008-January 2009, versus a 4% and

<sup>4</sup> [www.swift.com](http://www.swift.com): SWIFT is the Society for Worldwide Interbank Financial Telecommunication. 'SWIFT enables its customers to automate and standardise financial transactions, thereby lowering costs, reducing operational risk and eliminating inefficiencies from their operations.' SWIFT is solely a carrier of messages; It does not hold funds or manage accounts on behalf of customers. The IIC survey states the context in which the SWIFT statistics should be viewed: 'it is generally accepted that 80%-85% of trade transactions are settled on an open account (OA) basis', which may or may not be sent over the SWIFT network. Payment messages however, may not only be for a trade-related transaction (details of which are on pg.29 of the IIC report) and are therefore unsuitable for analysis. The SWIFT trade statistics therefore deal with the remaining 15-20% of trade not settled on an OA basis, such as LCs, of which response shows a high proportion of banks' LCs are sent via the SWIFT network.

3% decline in the value of Export Credit Insurance and Short-term Export Working Capital over the same period respectively. The number of banks reporting a decline in the value of LCs increased by 16% to 71% for the period October 2008 through January 2009. Table 2 summarises the perceived key factors driving the decline in the value of trade transactions.

**Table 2: Principal reasons for the decline in value of trade transactions**

Reason	% of respondents
A fall in the demand for trade activities	73%
Less credit availability at your own institution	57%
Less credit availability at your counterparty banks	57%
A fall in the price of transactions	43%
A shift towards cash-in-advance transactions	14%
A shift toward open account	14%
Economic crisis; increased risk at the global level	11%
Other	11%

(SOURCE: IMF-BAFT, FIMETRIX, 2009)

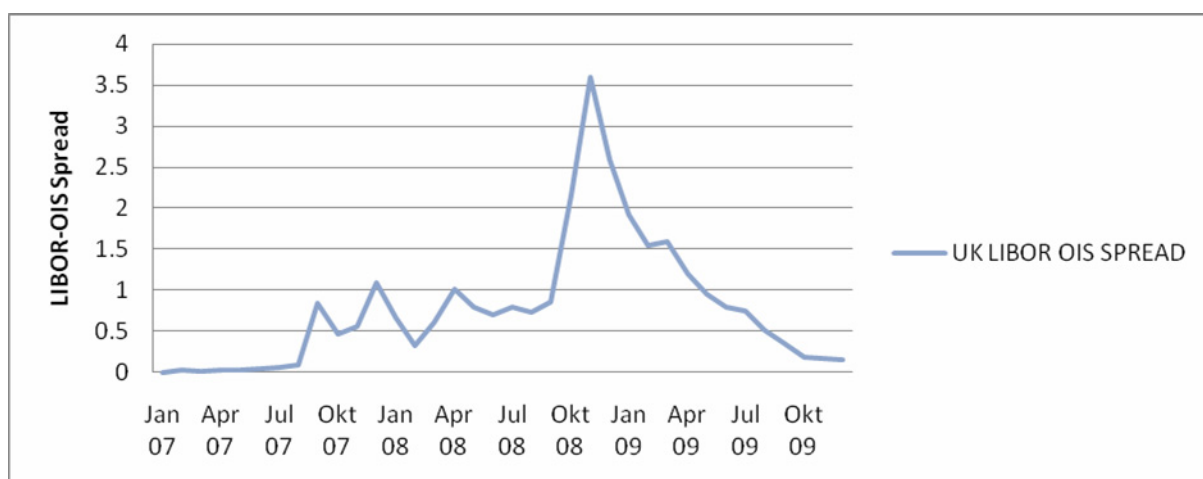
There is also considerable evidence that the price of trade instruments increased over the period. The role of trade finance in enabling trade has been well documented, and so not surprisingly it is important to assess the possible impact any restrictions in that finance may have had on trade flow. Auboin (2009), in discussion of the role trade finance has played in enabling the vast expansion of trade over the centuries, states ‘trade finance normally offers a high degree of security to the trade transaction and its payment. Such prime corporate lending carries normally little risk and hence a small fee (typically a few basis points over the Libor<sup>5</sup> for a prime borrower).’

The Libor-OIS spread<sup>6</sup> (Libor-Overnight Index Swap) is a key measure of credit risk, and therefore a useful measure reflecting banks’ willingness to lend. It is computed as the overnight index swap rate which is based on the rates set by central banks, subtracted from Libor. The Libor-OIS spread therefore shows the amount of interest that is being charged for the credit risk, where an increase in the difference is a reflection of a decreased willingness to lend. The graph below depicts the UK Libor-OIS spread from August 07 to October 2009. As can be rapidly seen from the graph there the spread rises towards the beginning of the period, followed by a substantial spike in October 2008, with a subsequent gradual decline. In our regression we therefore use this Libor-OIS spread calculated over the duration of our sample as a way of capturing the degree of firms’ access to trade finance.

<sup>5</sup> ‘The Libor is the benchmark used by banks, securities houses and investors to gauge the cost of unsecured borrowing in the money market... giving an indication of the average rate a leading bank, for a given currency, can obtain unsecured funding for a given period in a given currency. It therefore represents the lowest real-world cost of unsecured funding in the London market’. Source British Bankers’ Association (BBA).

<sup>6</sup> An OIS is a fixed rate interest rate swap against a floating rate index, e.g. SONIA or EURONIA. The Sterling Overnight Interbank Average (SONIA) tracks actual Sterling overnight funding rates experienced by market participants and was developed by the Wholesale Markets Brokers’ Association (WMBA).

**Figure 5: UK LIBOR-OIS Spread 3m Maturity**



As we are interested in the impact of the crisis on trade between members of regional trade agreements, we then include each of the included agreements for the 36 country sample. These are: EU, EU-Turkey, EU-Tunisia, EFTA-Bulgaria, NAFTA, CEFTA, SAPTA, EU-EFTA, EFTA-Turkey, EFTA-Czech Republic, EFTA-Lithuania, EFTA-Hungary and EFTA-Poland<sup>7</sup>. Each of these is identified via an RTA dummy variable. We are also interested in exploring whether there is any differential impact of trade depending on countries GDP per capita income levels. Hence we also create North-North, North-South and South-South dummy variables, which are labelled NN above, based on the World Bank's classification of a countries' income (based on GNI per capita, Atlas method). Details can be found in Appendix 1.

The variable DShare then captures the share of consumer durables and parts and accessories in bilateral trade. Recall, that in the explanations for the collapse in trade several authors point to the importance of the composition of trade. Eaton et.al point to the importance of consumer durables, Alessandria to the role of inventories, and Levchenko to the impact of vertical linkages and supply chains. These explanations are in each case slightly different but all point to the importance of the composition of trade, and suggest that fall in trade was particularly dramatic precisely because it impacted on that composition. In order to capture this, we calculate the share of both consumer durables, and parts and accessories (based on the BEC 2-digit classification, where we have included section 42, 53 and 61), in bilateral trade for the period prior to the crisis. Specifically, and in order to avoid annual fluctuations we take the average of this share over the three year period 2005-2007. Hence, inventories holdings are more likely to be higher for producers and or retailers of consumer durables; and consumer durables also tend to be higher value added goods in which vertical supply chains are more important. Thus by taking this share, we encompass each of the above possible explanations – though of course we cannot distinguish between them.

Finally, we are interested in identifying the possible role of protection in impacting on trade flows. The leaders of the G20 in Washington in November 2008, explicitly vowed to avoid

<sup>7</sup> NAFTA= North American Free Trade Agreement (FTA); CEFTA= Central European FTA; SAPTA= South Asian Preferential Trading Arrangement; EFTA= European FTA

protectionist measures and as of the beginning of 2009, Pascal Lamy (Director General of the WTO) said there had been little evidence of such (WTO inconsistent) protectionist measures. However, by July 2009, a WTO report states 'the number of new trade restricting or distorting measures announced or implemented since 1 March 2009 exceeds the number of new trade liberalising or facilitating measures by a factor of more than two.' The WTO has initiated an increased number of anti-dumping and safeguards investigations, and has seen increasing numbers of tariff increases and new non-tariff barriers.

Protectionism is typically difficult to quantify and to model empirically. A good example of this debate is the 'Buy American' provision in the United States', and the substantial \$787bn fiscal stimulus package (plus a \$50bn plan to aid homeowners). Accompanying the stimulus package, the Buy American provision was extended in February 2009, specifying that only domestically produced ('produced' consisting of all essential steelmaking operations) manufactured goods and iron, along with steel, are to be used in public procurement. Other countries too imposed measures which potentially discriminate against foreign competition. The Swedish government for example, offered Saab and Volvo up to U.S \$5.3bn in loans and credit guarantees subject to it being spent in Sweden; and both the British and American governments have subsidised their automotive industries.

The Global Trade Alerts team (GTA) (Evenett, 2009) have compiled a database which includes details of the number of 'protectionist' measures implemented, the number of HS 4-digit tariff lines affected by measures and the number of trading partners affected, and covers the period under consideration. For this study we have taken this database and the information contained within in order to create the variable "Protection". This has been created by taking each reported instance of a trade measure having been introduced for each of our partner countries. The database then specifies which reporter countries are most likely to be affected by the measure, and the date of inception of that measure. Suppose between a given bilateral pair there is a single measure which was introduced in the 13<sup>th</sup> month of our sample. The measure would therefore be 0 prior to the 13<sup>th</sup> month and 1 subsequently. However, in some cases there is more than one measure introduced between a given bilateral pair. Following the preceding example, it could then be that there is another measure introduced in the 17<sup>th</sup> month of the sample. Hence the variable would now take the value of 2 after the 17<sup>th</sup> month. It is also worth noting that the GTA database also gives information on trade liberalisation measures, and we model these separately. In total, out of 1260 country pairs in our sample, the database identifies the introduction of a trade policy measure in 675 cases, of which 50% are classified as trade restricting measures and 50% as trade neutral / trade liberalising measures. The former variables are labelled "Protection" and the latter "TRLib".

## 5. Data

The gravity modelling in this paper is based on data for 36 countries (listed in Appendix 1) over a 36 month period from January 2007 to December 2009; thus the panel consists of 41887 observations. For each of the 37 countries bilateral monthly trade and an index of monthly production was obtained from the IMF. On the basis of the monthly industrial production index a monthly output variable was created by taking, the share of January's

industrial production for 2007 and multiplying this by the annual 2007 GDP figure (World Bank).

The standard gravity variables distance, landlocked, common language and common colony were obtained from Andrew Rose's website. As discussed above the information on protection and trade liberalisation measures was obtained from the GTA database; and the information on the share of consumer durables, parts and accessories from the COMTRADE dataset.

## **6. Results**

For the econometric analysis we then run a series of three sets of regressions. First we run a simple pooled regression where the motivation is not to provide an assessment of the impact of the crisis on trade, but to identify the key explanatory factors driving trade over the course of the 36 months. This is useful in order to provide an underlying understanding of the determinants of trade in the model, as opposed to the impact of the crisis on trade.

Secondly, we run a series of panel fixed effects regressions. Here we are explicitly interested in identifying the explanatory factors for the observed decline in trade. Specifically the advantage of the gravity modelling framework is that we can test for the impact of the crisis, the role of trade credit, the role of regional trade, the role of protection and the composition of trade all within a multi-country framework. Finally, we run a "peak-trough" regression which gives us an alternative approach to identifying the explanatory factors driving the decline in trade. For the peak-trough regressions, for each bilateral pair we identify the month where trade between the two countries was at its highest (peak), and the month when it was at its lowest (trough) and compute the difference; we then take the same two months and compute the difference in the activity variables, and the level of the other variables. So as opposed to running the regression on a month-by-month basis, here we are running the regression on the change between the peak and the trough. As the impact of the crisis on trade may have varied across the months across countries, this approach allows us to capture this variation.

### **6.1 Pooled Regressions**

Table 3 below gives the results for three different specifications of an OLS pooled regression over the entire time period. The dependant variable in all these regression is the logged value of bilateral imports. In the first column we introduce the standard gravity variables include the RTA dummy. Here we see that all the variables, except for perhaps the common colony dummy, and the RTA dummy have the expected sign and are highly statistically significant. Hence we see that both the level of activity in the reporter and partner countries is positive, that the coefficients on distance, and on whether the country is landlocked are both negative; while the coefficients on common language and whether the countries share a common border are positive. The negative coefficient on the RTA dummy is interesting because it suggests that ceteris paribus in our sample trade between RTA partners is in the order of 8% lower than between the remaining countries in our sample.

**Table 3: Pooled Regression**

Variable	1	2	3
lnREP_IP	0.6902 ***	0.6310 ***	0.6542 ***
LnPTN_IP	0.9158 ***	0.8594 ***	0.8755 ***
lnDist	-0.3537 ***	-0.3199 ***	-0.3101 ***
border	2.5595 ***	2.5763 ***	2.5630 ***
landlocked	-0.7569 ***	-0.7806 ***	-0.7878 ***
comcolony	-0.9420 ***	-0.9505 ***	-0.9953 ***
comlang	0.3859 ***	0.3683 ***	0.3841 ***
RTA	-0.0831 **		
NN		0.2737 ***	
NS		0.0706	
NN*RTA			0.1240 **
NS*RTA			-0.2071 ***
SS*RTA			-0.1699
Constant	8.1885 ***	8.5702 ***	8.3839 ***
R <sup>2</sup>	0.2863	0.2867	0.2874

\*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels respectively

In the second column of the table we drop the RTA variable and instead consider whether trade is higher/lower between North-North, and North-South countries relative to South-South trade; and then in the third column we interact the NN, NS and SS dummies with the RTA variable. What we see from these results is that NN trade is statistically higher than while there is no evidence that NS trade is any higher. We also see that if we distinguish between high income (NN) countries who are also members of an RTA then trade is up to 13% higher, while for members of a NS RTA trade is just over 20% lower, in each case in comparison to the rest of the sample.

## 6.2 Panel Regressions – explaining the trade decline

As discussed above in this set of regressions we are now concerned with identifying the key factors driving the decline in trade. The methodology is a panel fixed effects regression analysis<sup>8</sup>, where as before the dependant variable is the logged value of bilateral imports. The coefficients have a dynamic interpretation and can be seen to be identifying the impact on trade as a result of the change in the variables. As distance, common language etc are time-invariant these variables are dropped.

The results in Table 4 are extremely interesting. If we take the first column of results here we are focussing on the activity variables and our crisis dummies. These dummies in principle could capture a change in any underlying factor impacting on trade, but where the key likely explanatory factors are likely to be changes in trade credit, and possibly also compositional changes in demand. Of course the compositional changes may in turn be linked to changes in trade credit. We find that changes in activity suggest that a 10% decline (in partners') demand leads to approximately a 4% decrease in trade. Hence the elasticity

<sup>8</sup> The random effects model was rejected by the Hausmann test.



here is significantly less than one, and less than that found in previous work. We also find that there is no evidence of an impact on trade at the beginning of the crisis in August 07, but a significant negative impact on trade after September 2008, with either trade declining by over 20%. We also see some statistically significant increase in trade after August 2009.

In column two we then add in the two trade policy dummies – one to capture changes in protection and the other any liberalisation policies that were introduced, as derived from the GTA database. Here we find no evidence that liberalisation measures increased trade, but curiously some evidence that the protectionist measures increased as opposed to decreased trade. This result is counterintuitive, but also somewhat anomalous as it is not supported in subsequent regressions. In the subsequent column we examine whether there is any evidence that the crisis impacted differentially on countries who were part of a regional trading agreement.

In the fourth column of the table we explore then role of the “consumer durable and parts and accessories” share in trade (DShare), and where we interact this share with our crisis dummies. If the hypothesis regarding the composition of trade being an important explanatory factor was correct we would expect the coefficient where the variable is interacted with the crisis worsening dummy to be negative, and with crisis end to be positive. However, in column 4 while the sign of the coefficients is as would be expected, the size of the coefficients is small, and the coefficients are insignificant. This suggests, *prima facie*, that for the sample as a whole, compositional changes may not have been significant. In column 5 we then do a double-interaction and interact the DShare and crisis dummies with the RTA dummy. Here we are therefore exploring whether compositional changes may have been significant for RTA members. We now find that when controlling for RTA membership that compositional effects did indeed appear to have an impact on trade. The impact is substantial when looking at the worsening of the crisis after September 2008, and then we see a much more significant rebound of trade driven by compositional factors as trade recovered from the crisis dip.

**Table 4: Panel regressions: Regional Trade and compositional effects**

Variable	1	2	3	4	5
ln REP_IP	0.640 ***	0.614 ***	0.621 ***	0.685 ***	0.692 ***
lnPTN_IP	0.438 ***	0.448 ***	0.453 ***	0.429 ***	0.431 ***
Crisis	0.070 ***	0.073 ***	0.058 **	0.072 ***	0.061 ***
CrisisW	-0.196 ***	-0.241 ***	-0.226 ***	-0.186 ***	-0.178 ***
CrisisEND	0.036 ***	0.037 ***	-0.134	0.017	-0.018
crisis*RTA			0.024		
crisisW*RTA			-0.027		
crisisEnd*RTA			0.086 ***		
Dsh*crisis				-0.023	
Dsh*crisisW				-0.036	
Dsh*crisisEnd				0.078	
Dsh*c*RTA					0.059
Dsh*cW*RTA					-0.135 ***
Dsh*cEnd*RTA					0.459 ***
Protection		0.015 **	-0.17 **		
Lib		0.013			
Constant	9.339 ***	10.50 ***	***	9.178 ***	9.12 ***
R <sup>2</sup>	0.1965	0.212		0.184	0.185

\*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels respectively

In Table 5, we then explore a similar set of issues but now instead of using our crisis dummies as a possible proxy for changes in trade finance we explicitly model trade credit and the riskiness associated with it by including the Libor-OIS spread in our regressions. In column 1 we include the activity variables together with the Libor-OIS variable. As before, we find that economic activity does impact on trade but again with an elasticity of less than one. We also find that changes in credit risk also had a negative impact on trade. Given the actual changes in the spread that took place, we find that the rise in credit risk is associated here with a fall in trade of up to 12%. If we include the trade policy variables (column 2), the impact of changes in trade credit rise slightly, and we also now see that the protectionism measures introduced did serve to negatively impact on trade. Once again there is no evidence that measures taken to liberalise trade impacted positively on trade, as this variable is insignificant. This variable is dropped in subsequent regressions.

In columns 3-5 we focus more explicitly on the possible role of membership of regional trading agreements. Hence in column 3 we see that while credit risk has a negative impact on trade, that impact is much greater for those countries who are part of an RTA. Once we control also for any changes in protection (in columns 4 and 5), the negative impact of credit risk remains, and we see that the impact is highest for those countries who are either part of a North-North RTA, or those countries who are part of a North-South RTA. In each case we also see the negative impact of trade protectionist measures on trade flows.

**Table 5: Panel regression with Libor-OIS spread**

Variable	1	2	3	4	5
ln REP_IP	0.8005 ***	0.825 ***	0.8025 ***	0.832 ***	0.836 ***
lnPTN_IP	0.5980 ***	0.567 ***	0.6021 ***	0.568 ***	0.565 ***
LIBOR-OIS	-0.0398 ***	-0.048 ***	-0.0135	-0.033 ***	
Protection		-0.033 ***		-0.035 ***	-0.034 ***
PTLib		-0.123			
RTA*Libor			-0.0449 ***	-0.027 **	
RTA*NN*Libor					-0.061 ***
RTA*NS*Libor					-0.062 ***
RTA*SS*Libor					0.003
Constant	6.9862 ***	8.058 ***	6.9403 ***	7.99 ***	7.97
R <sup>2</sup>	0.2016	0.1962	0.2008	0.1951	0.193

\*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels respectively

The picture that is emerging therefore is one where changes in demand negatively impacted on trade as did changes in trade credit as well as protectionist measures introduced by countries. The evidence also suggests that this impact was greatest for countries part of a regional trading agreement, and in particular those involving high income countries – either with respect to NN agreement, or with respect to NS agreements. In Table 4 we also identified the possible importance of compositional effects. This is explored in more detail in Table 5 below, together with a closer consideration of the differential impact of the crisis depending on income per capita.

For each of the regressions in Table 5 we include the standard activity variable in order to capture the impact of variations in demand, and the Libor-OIS spread in order to capture changes in trade credit (through the proxy of credit risk). We then run a series of regressions where we want to identify the role of compositional changes across different categories / groups of countries. Column 1 of the table explores the interaction between the compositional effect variable, Dshare, with the RTA and crisis dummies. Here we are therefore exploring whether in addition to activity and trade credit, there is evidence to suggest that compositional effects may have been more significant for RTA member countries. The results strongly support this hypothesis. In particular with regard to the period post September 2008 we see very strong compositional effects driving the decline in trade for RTA member countries; we also then see compositional effects playing an important part in the emerging subsequent recovery of trade.

In the subsequent columns we then investigate the importance of compositional effects with respect to North-North, North-South and South-South bilateral trade flows respectively. Once again the results are interesting and suggest the importance of compositional effects. We see that these were important for each of the above types of bilateral trade flow, with the biggest impact on South-South trade. Interestingly there is no evidence that with regard to these categories of bilateral trade flows that compositional effects were significant in the recovery trade. The difference between the NN, NS, SS results and those where we focus on RTAs is interesting. Clearly there may be some overlap between these groupings. The EU countries, for example form a significant part of our sample, and it could be that this may dominate the results. If that was the case one might

expect very similar results between the RTA interaction coefficients and the NN interactions coefficients. As this is not the case this suggests that we are indeed separately identifying RTA effects from NN trade effects.

**Table 5: Panel regression with Libor-OIS spread and composition effects**

Variable	1	3	4	5
ln REP_IP	0.783 ***	0.791 ***	0.809***	0.838***
lnPTN_IP	0.515 ***	0.538 ***	0.553***	0.579***
LIBOR-OIS	-0.018 ***	-0.026 ***	-0.31***	-0.038***
Dshare*RTA*Crisis	0.277 ***			
Dshare*RTA*CrisisW	-0.698 ***			
Dshare*RTA*CrisisEnd	0.287 ***			
Dshare*NN*Crisis		0.175 ***		
Dshare*NN*CrisisW		-0.49 ***		
Dshare*NN*CrisisEnd		-0.044		
Dshare*NS*Crisis			0.239***	
Dshare*NS*CrisisW			-0.48***	
Dshare*NS*CrisisEnd			0.055	
Dshare*SS*Crisis				0.41
Dshare*SS*CrisisW				-0.742***
Dshare*SS*CrisisEnd				-0.229
Constant	7.82 ***	7.60 ***	7.35***	6.95***
R <sup>2</sup>	0.19	0.19	0.19	0.19

\*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels respectively

### 6.3 Peak-Trough Regressions

We now turn to an alternative approach to identifying the causal factors underlying the trade decline, and undertake “peak-trough” regressions. Here, for each bilateral pair we identify the month where trade between the two countries was at its highest (peak), and the month when it was at its lowest (trough) and compute the difference; we then take the same two months and compute the difference in the activity variables, and the Libor-OIS spread, while we take the level of the other variables. It is likely that as the financial crisis impacted on trade that the temporal dynamics varied across countries. By allowing the peak-trough to vary across countries we therefore capture that variation. It is important to note that these are therefore not panel regressions but effectively a cross-section regression which captures the change in trade and in part attempts to explain that change in trade through the change in activity (industrial production), the change in trade credit; and then through the level of the other factors.

Take the first column of the table. Here we see that changes in activity did indeed impact on the changes in trade, as did a number of the time invariant variables. Interestingly, for example, countries with a common border saw a bigger decline in trade – this could again capture either RTA effects or indeed closer supply chain integration between contiguous

countries. As in the earlier results we also the role of trade credit in negatively impacting on trade flows. Indeed this coefficient is statistically significant and with a similar value across all the regressions.

**Table 6: Peak-Trough regressions**

Variable	1	2	3	4	5
PT ln REP_IP	0.347 ***	0.317 ***	0.242 ***	0.264 ***	0.302 ***
PT ln PTN_IP	0.374 ***	0.325 ***	0.283 ***	0.312 ***	0.322 ***
lnDist	-0.020	0.094	-0.124 *	-0.153 **	-0.088
border	1.767 ***	1.826 ***	1.833 ***	1.840 ***	1.96 ***
landlocked	-0.812 ***	-0.846 ***	-0.975 ***	-1.01 ***	-0.934 ***
comcol	-1.579 *	-1.634 *	-1.48	-1.50	-1.613 *
comlang	0.724 **	0.655 **	0.54 *	0.569 *	0.665 *
PT LIBOR-OIS	0.242 ***	0.243 ***	0.196 ***	0.221 ***	0.221 ***
RTA	0.177				
Dshare			1.78 **		
NN*RTA		0.599 ***			
NS*RTA		-0.143			
SS*RTA		0.204			
NN			0.645 **		
NS			0.027		
NN*Dshare				2.92 ***	
NS*Dshare				1.12 *	
SS*Dshare				-0.92	
NN*RTA*Dshare					3.29 ***
NS*RTA*Dshare					0.517
SS*RTA*Dshare					0.700
Constant	14.404 ***	13.884 ***	15.69 ***	15.939 ***	13.99 ***
R <sup>2</sup>	0.3339	0.3481	0.365	0.3609	0.356

\*\*\*, \*\*, and \* denotes significance at the 1%, 5% and 10% levels respectively

There is no evidence in this regression that RTA membership is statistically correlated with the changes in trade flows. However, this is explored in more detail in the subsequent regression in column 2. Here we distinguish we interact the RTA variable with the NN, NS, and SS variables, and we find that the decline in trade is particularly noticeable for high income countries who are part of a common regional trade agreement. In column 3-5 we then investigate the possible importance of compositional effects. In column 3 we simply introduce the Dshare variable, as well as distinguishing between NN and NS bilateral pairs. Here we say that compositional effects were indeed important, and also that the decline in trade was more pronounced with respect to NN trade. In column 4, we examine the interaction between the compositional effects and the NN, NS, and SS dummies. Consistent with our earlier results we find that compositional changes appear to have been particularly important with regard to trade between high income countries, as well as to some extent on

trade between high income and low income countries. There is no evidence here that compositional effects were significant between low income countries. Finally in column 5, we introduce a double interaction and consider whether, for example, compositional effects were more (or less) significant between high income countries who are members of an RTA; and then similarly for RTA trade flows between high and low income countries, and between low income countries. The results strongly suggest that the compositional factors were indeed particularly important for RTA members, and more so where trade between high income countries is concerned.

## 7 Conclusions

This paper builds upon the existing literature examining the collapse in trade which took place as a result of the financial crisis. That literature has variously identified the possible role of the level of demand, the composition of demand, the composition of supply (e.g. vertical specialisation), changes in protection, and changes in access to trade credit as explanatory factors for the nature and size of decline. Given the importance of regional trading agreements in the world economy, the substantial rise in the number of such agreements in recent years, and the likely future importance of such agreement with the stalling / collapse of the Doha round, it is interesting that the impact of the crisis on regional trade has not to date been examined.

In the work presented here we directly address that issue as well as provide evidence on each of the factors listed above. In comparison to most of the existing literature we work with monthly data in a multi-country context. This in turn means that we inevitably work with a slightly restricted sample of 36 countries, and therefore our results should be viewed bearing this in mind.

Nevertheless there are a number of clear and consistent messages that emerge from this analysis. First, we find that changes in demand (economic activity) did indeed negatively impact on trade, but typically by less than has been argued by previous authors. Secondly we find clear evidence that changes in trade credit appear to have impacted negatively on trade flows; as did the introduction of protectionist measures by some countries. Fourthly, we find that compositional effects were also important. Here it is worth noting that while the evidence is clear on compositional effects, this does not explain what drove those compositional effects. Hence the compositional effects story could be explained directly by a decline in expenditure on consumer durables by individual / households, and by inventory management by firms. It could equally be explained by a contraction in supply chain activity as discussed towards the beginning of this paper. Finally *each* of the preceding could in turn be driven by changes in access to credit and trade credit, which are results consistently shown were an important factor in the decline in trade. Hence, the compositional effect explanation and the trade-credit explanation are complementary and quite possibly interlinked.

Finally and with regard to each of the above we find consistent evidence that countries who belonged to a regional trading agreement, and in particular between high income countries experienced a bigger decline in trade, and where the role of the composition of trade was also more significant.

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## Appendix 1: Country Sample

North/South classifications are based on the World Bank's income classification (GNI Atlas Method). Lower-middle- and low-income countries are classified as southern countries; upper-middle- and high-income are therefore classified as northern.

N	IMF Code	Country	North/South Classification
1	911	Armenia	S
2	122	Austria	N
3	513	Bangladesh	S
4	316	Barbados	N
5	124	Belgium	N
6	918	Bulgaria	N
7	156	Canada	N
8	960	Croatia	N
9	423	Cyprus	N
10	935	Czech rep	N
11	128	Denmark	N
12	172	Finland	N
13	132	France	N
14	134	Germany	N
15	174	Greece	N
16	944	Hungary	N
17	534	India	S
18	178	Ireland	N
19	136	Italy	N
20	158	Japan	N
21	439	Jordan	S
22	542	Korea	N
23	946	Lithuania	N
24	548	Malaysia	N
25	273	Mexico	N
26	138	Netherlands	N
27	142	Norway	N
28	964	Poland	N
29	182	Portugal	N
30	936	SlovakRepublic	N
31	184	Spain	N
32	144	Sweden	N
33	744	Tunisia	S
34	186	Turkey	N
35	112	United Kingdom	N

**Appendix 2: Data Sources and Details**

<b>Variable Name</b>	<b>Description</b>	<b>Source</b>	<b>Notes</b>
LnMcif	Imports c.i.f. Constant USD.	IMF DOTS	Dependent variable
Output1 (& Inoutput1)	Monthly (Industrial Production) IP index 'applied' to annual GDP per capita for country 1 (reporter) (cons. USD per capita)	IP (IMF IFS), GDPPC from WEO (WB)	I.P index is unadj. purely because greater availability
Output2 (& Inoutput2)	Monthly IP index 'applied' to annual GDP per capita for country 2 (partner) (cons. USD per capita)	IP (IMF IFS), GDPPC from WEO(WB)	I.P index is unadj. purely because greater availability
Dist and Ldist	Distance (Km) between the capitals or each country (and its natural log)	A.Rose's website	Consistent with the Great Circle measure
Border	Border dummy	A.Rose's website	(0-1)
Landl	Landlocked dummy	A.Rose's website	(0-1-2) 1, or both of pair land locked
Comlang	Common language dummy	A.Rose's website	(0-1)
Comcol	Common colony dummy	A.Rose's website	(0-1)
RTA Dummies		Sussex Economics Dept.	(0-1) Updated for post 2005 agreements
Highmedinc	'High' and 'upper middle' income countries by 2008 GNI per capita ∴	RTA dummies aggregated by the WB's classification of countries (Atlas Method)	
Lowmedinc	GNI p.c. ≥\$3856 (ref. reporter→cty1) 'Low' and 'lower middle' income countries by 2008 GNI per capita ∴	RTA dummies aggregated by the WB's classification of countries (Atlas Method)	
	≤\$3855 (ref. reporter→ cty1)		
Crisis dummy	1 if August 2007 onwards		
Crisis worsening	1 if October 2008 onwards		
NN	North-North country pair		
NS	North-South country pair		
SS	South-South country pair		