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Julian Hinz

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Essays on International Trade and Foreign Policy

Julian Hinz

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Directeur de thèse:

Matthieu Crozet, Professeur, Université Paris Sud / Paris Saclay, France

Jury:

Keith Head (Rapporteur), Professeur, Sauder School of Business, University of British Columbia, Canada

Vincent Vicard (Rapporteur), Economiste (HDR), Banque de France, France

Gabriel Felbermayr, Professeur, Ludwig-Maximilians-Universität München & Ifo Institut, Allemagne

Lionel Fontagné, Professeur, Université Paris 1 Panthéon-Sorbonne & Paris School of Economics, France

Ariell Reshef, Directeur de Recherche, CNRS, Université Paris 1 Panthéon-Sorbonne & Paris School of Economics, France

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¹See also Price and Rees (2013).

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Résumé

Les flux commerciaux, la politique commerciale et la politique étrangère sont de plus en plus entremêlés dans un monde où la mondialisation a créé des liens économiques et politiques profonds entre presque tous les pays. La politique étrangère a toujours été orientée par des intérêts commerciaux. L'expansionnisme romain à travers de vastes régions du centre de l'Europe et de la Méditerranée, ainsi que les expéditions coloniales européennes dans des contrées lointaines sont les premières manifestations de l'influence des intérêts commerciaux et économiques sur les politiques dirigées vers des entités étrangères (Findlay and O'Rourke, 2007). De plus en plus, cependant, la politique étrangère est menée sous le voile de la politique commerciale. La mondialisation, plus particulièrement au sens de la libéralisation des échanges, n'a pas seulement créé un tissu d'interdépendance, mais des dépendances importantes voire critiques entre les pays. La suspension ou une simple menace de rupture des relations commerciales, ou la perspective d'une réduction de barrières du commerce, sont facilement utilisées pour poursuivre des objectifs politiques non liés au commerce. Les récentes sanctions envers les individus et les entreprises russes sont le dernier exemple de l'utilisation de mesures économiques à des fins politiques. De l'embargo cubain par les Etats-Unis à la création d'un accord d'accès préférentiel au marché européen au nom de « la politique de voisinage », son utilisation s'est multipliée.

Le sujet de cette thèse porte sur l'analyse de ces liens entre la politique étrangère et le commerce international, hormis un chapitre qui est de na-

ture plus méthodologique. Dans le chapitre 1, j'étudie dans quelle mesure les intérêts géopolitiques sont une motivation essentielle pour la formation d'accords d'intégration économique. Les grands pays—définis en termes de PIB—négocient et signent systématiquement des accords avec des pays plus petits qui offrent plus d'avantages en termes politiques qu'en termes économiques. Le chapitre 2 propose une analyse empirique sur les effets des sanctions sur les pays sanctionnant, et plus particulièrement sur leurs exportations. Dans ce travail en collaboration avec Matthieu Crozet, nous examinons l'impact macroéconomique du régime de sanctions contre la Fédération de Russie sur les flux d'exportation des pays occidentaux, et l'impact microéconomique sur les entreprises exportatrices françaises. Les sanctions étant un instrument populaire de la politique étrangère, leur coût sur l'économie utilisant cet instrument est souvent négligé. Nous montrons que ces « dommages collatéraux » peuvent être importants. Dans le cas des sanctions contre la Russie, ils s'élèvent à \$ 3,2 milliards par mois. Le chapitre 3 centre son analyse sur l'étude du mécanisme par lequel les relations politiques entre pays influent leurs flux commerciaux. Conjointement avec Elsa Leromain, nous montrons comment les pays adaptent leur mode d'approvisionnement, leur importation d'inputs intermédiaires au climat politique avec leur partenaire commercial. Une aggravation des relations politiques conduit à une diminution des importations, en particulier pour les produits qui sont essentiels au fonctionnement de l'économie nationale. Enfin, dans le chapitre 4, j'explore une question méthodologique en établissant la façon dont les coûts commerciaux *devraient* être agrégés, des niveaux inférieurs d'agrégation géographique au plus élevés, en prenant l'exemple de la définitions des distances moyennes entre pays. En utilisant l'imagerie satellite sur l'émission de lumière nocturne pour mesurer l'activité économique locale, je calcule des distances cohérentes avec la théorie de gravité du commerce international pour tous les couples de pays et ce depuis 1992. Cette mesure fournit une autre réponse à « l'énigme de la frontière ».

De la gravité et de la politique comme coûts commerciaux opaques

Bien que les sujets abordés dans cette thèse de doctorat traitent de la politique commerciale, des sanctions économiques et du coût des échanges, les littératures auxquelles les chapitres contribuent sont interconnectées. Ceci étant, chacun des sujets aborde des questions particulières qui les placent aussi dans des sous-littératures très spécifiques du commerce international.

Tous les chapitres de cette thèse se fondent dans une certaine mesure sur les progrès récents de la littérature sur le modèle de gravité en commerce international. Le concept—emprunté à la physique ainsi que sa terminologie—lie les échanges de marchandises d’un endroit à un autre au coût du commerce *bilatéral* et aux masses économiques des pays partenaires, sous une forme qui ressemble à leur production et dépenses ajustés par ce qu’on appelle la *résistance multilatérale*. Le concept a d’abord été introduit par Tinbergen et al. (1962), qui a décrit le volume des échanges entre les pays en fonction de leur PIB et de la distance. Les fondements théoriques de l’équation de gravité ont depuis été largement améliorés grâce aux travaux de Anderson (1979), Anderson and van Wincoop (2003) et d’autres auteurs. Head and Mayer (2014) donnent un aperçu de l’état de cette littérature et soulignent qu’il existe un large éventail de fondements microéconomiques que l’on appelle la “gravité structurelle”. Dans cette thèse de doctorat, je tire parti de plusieurs des caractéristiques de la gravité structurelle. Dans les chapitres 1 et 2, la gravité structurelle est utilisée pour calculer les contrefactuels d’équilibre général, suivant Dekle et al. (2007, 2008) et Anderson et al. (2015). Le chapitre 2 contribue à ce volet de la littérature en montrant que des contrefactuels théoriques peuvent être calculés uniquement à partir des flux commerciaux *observés*. Dans le chapitre 4 je présente une agrégation des coûts du commerce théorique cohérente avec une équation de gravité structurelle.

Les trois premiers chapitres sont aussi liés de par leur connexion à la littérature sur les effets de la politique sur le commerce (et vice versa). Head and Mayer (2013) discutent des obstacles non-traditionnels au commerce, qui sont observables, mais difficiles à mesurer—*coûts commerciaux opaques*—et en grande partie liés à des éléments historiques. Il a été montré que les réseaux ethniques (Rauch and Trindade, 2002) et les liens coloniaux (Head et al., 2010) ont un impact positif considérable sur le commerce bilatéral. D'autres études étudient l'impact de caractéristiques politiques et sociales sur le commerce bilatéral. Umana Dajud (2013) analyse l'impact d'une "proximité politique" sur les flux commerciaux, estimant que les pays gouvernés par des gouvernements qui sont similaires en termes de position à gauche / droite du spectre politique et leur degré d'autoritarisme / libéralisme, échangent plus de marchandises. Dans un article analogue, Yu (2010) établit que les démocraties ont tendance à commercer davantage entre eux. D'autre part, un conflit (récent) est, sans surprise, néfastes pour les échanges économiques: Glick and Taylor (2010) quantifient les effets de la guerre sur le commerce international et sur l'économie en général. Leur approche—similaire à celle employée dans le chapitre 2—repose sur un cadre de gravité qu'ils utilisent pour mesurer les pertes en tenant compte des changements dans les résistances bilatérales et multilatérales. Martin et al. (2008a) et Martin et al. (2008b) analysent la prévalence et la gravité des guerres interétatiques et des guerres civiles du point de vue du commerce international. Ils montrent que l'ouverture commerciale multilatérale augmente la probabilité d'escalade avec un autre pays, alors que le commerce bilatéral direct tend à réduire la probabilité d'escalade. De même, les guerres civiles à petite échelle sont présentées comme alimentées par l'ouverture du commerce, alors que cette dernière diminue la probabilité de conflits à grande échelle. Pourtant, d'autres mettent en évidence l'impact des questions liées à la sécurité sur le commerce, en particulier le « détournement » des envois (Anderson and Marcouiller, 2002; Marcouiller, 2000), le terrorisme (Mirza and Verdier, 2008; de Sousa et al., 2009, 2010) et la piraterie internationale (Bensassi and Martínez-Zarzoso, 2012).

Un autre volet de cette littérature analyse les réponses commerciales suivantes des « chocs » diplomatiques soudains, parfois supposés conduire à des changements dans les préférences des consommateurs. Fuchs and Klann (2013) montrent que des réunions en haute instance avec le dalaï-lama sont coûteuses pour le pays hôte car le commerce bilatéral avec la Chine en est diminué considérablement l'année suivante. Dans le chapitre 3, nous nous inspirons de leur approche et étudions la rupture de relations diplomatiques par la convocation d'un ambassadeur pour mesurer l'effet de la politique sur des produits clés. Michaels and Zhi (2010) montrent que l'affrontement diplomatique entre la France et les Etats-Unis concernant la guerre en Irak en 2003 a réduit de manière significative le commerce entre les deux pays pendant d'une courte période. Pandya and Venkatesan (2016) exploitent des données de scanner et montrent que les ventes sur le marché américain de marques à consonance française ont été réduites pendant le conflit. Heilmann (2016) étudie l'impact des différentes campagnes de boycott sur le commerce en utilisant une méthodologie de groupe témoin synthétique.

Dans ce qui suit, je donne un bref résumé des résultats de chacun des quatre chapitres de cette thèse de doctorat et je montre comment ils s'intègrent dans les littératures plus spécifiques auxquelles ils visent à contribuer.

Motivations géopolitiques de l'intégration économique

Dans le chapitre 1, j'explore les motivations non-traditionnelles de l'intégration économique, et en particulier les motivations géopolitiques. Depuis la fin de la guerre froide, le nombre d'accords d'intégration économique (EIA) à travers le monde a explosé. Alors que certaines régions ont connu des efforts d'intégration dans les décennies précédentes, notamment sur le

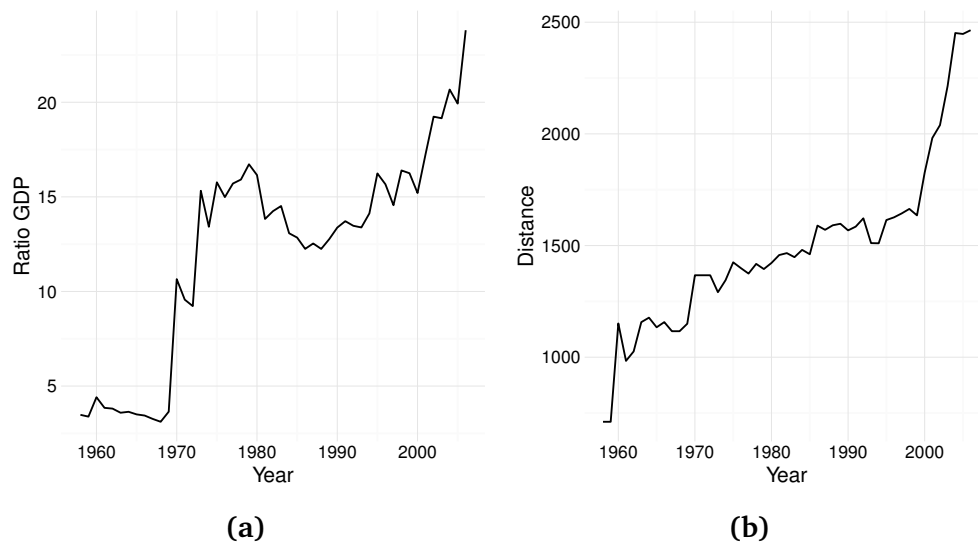


Figure 1: Le ratio moyen du PIB (a) et la distance moyenne (b) entre deux pays dans un EIA actif augmente au fil du temps.

continent européen, quelques accords existent qui selon Krugman (1991) et Frankel et al. (1995) sont dits « anaturel » —entre des pays partenaires très éloignés géographiquement et très différents.

Les graphiques 1a et 1b offrent un aperçu de la nature changeante des paires de pays qui forment les EIA. Depuis le début des années 1960, la distance moyenne et le ratio des PIB entre les pays dans les EIA sont en croissance et ont augmenté depuis les années 1990. Alors que l’augmentation marquée dans les accords régionaux et suprarégionaux commerciaux semble être fondée sur des avantages économiques évidents, souvent, il semble que le « commerce » ne soit la seule motivation. Le lien entre les relations politiques bilatérales et l’intégration économique entre les pays partenaires peuvent être profonds, comme probablement mieux illustré par l’accord sans doute le plus profond et le plus avancé qu’est l’Union européenne. Après deux guerres mondiales, les dirigeants politiques du continent se trouvent à la croisée des chemins, au cours de laquelle l’intégration économique a été considérée comme la seule façon de « préserver et renforcer la paix et la liberté », tel que codifié dans le préambule du « Traité instituant la Communauté européenne » (Findlay and O’Rourke, 2007).

Mais le continent européen n'est pas un espace unique en matière de lien entre les questions politiques et l'intégration économique. Partout dans le monde, des EIAs sont formés, qui défient l'intérêt commercial direct dans le but de *issue linkage*: Haas (1980) soutient que relier les questions politiques, commerciales et autres, crée un « régime » de collaboration internationale qui fournit des règles et forums pour régler les différends. Le chapitre 1 vise à répondre à la question de la façon dont la politique commerciale, sous la forme de la création d'un nouveau ou l'approfondissement d'un EIA existant, est influencée par des considérations de politique étrangère. Mises à part les motivations économiques traditionnelles, la politique commerciale de grands pays au sens économique semble être, au moins en partie, également conduite par des motivations géopolitiques.

Aux côtés de la littérature générale sur la connexion entre la politique et le commerce, ce chapitre est lié à une abondante littérature sur les déterminants et les effets de l'intégration économique. Limão (2016) donne un bon aperçu de la littérature sur les déterminants économiques et non-économiques des accords commerciaux préférentiels—ainsi que leur impact sur le commerce. Limão (2007) fournit le modèle de référence pour expliquer les déterminants non-traditionnels de l'intégration économique intégrant une question non-commerciale générique dans les négociations commerciales bilatérales et identifiant les implications sur la libéralisation du commerce multilatéral. Dans la partie théorique du chapitre, je me fonde sur ce modèle pour mettre en lumière le mécanisme par lequel les grands pays pourraient être motivés à s'intégrer économiquement avec des pays plus petits, mais intéressants en termes politiques.

La partie empirique puise aussi dans la littérature qui fournit des analyses des déterminants économiques des accords de libre-échange, comme par

exemple Baier and Bergstrand (2004) et Baier et al. (2014). Dans l'étude influente de Baier and Bergstrand (2007), ils quantifient les effets des accords de libre-échange sur les flux commerciaux, en tenant compte des questions d'endogénéité potentielle dans la sélection des accords d'intégration économique. Vicard (2009) montre que les pays ont tendance à créer différents types d'intégration économique, alors même qu'ils ont des impacts commerciaux similaires. Aichele et al. (2014), en contribuant au débat en cours sur les effets économiques et politiques du partenariat transatlantique de commerce et d'investissement entre l'Union européenne et les États-Unis, estiment l'impact de l'intégration économique en Atlantique Nord sur le commerce brut, le commerce en valeur ajoutée et le bien-être dans un cadre d'équation de gravité structurelle similaire à celui de Caliendo and Parro (2015).

Comme indiqué ci-dessus, des travaux antérieurs ont établi des liens entre les EIA et les conflits, capturant une facette de motivations politiques. Martin et al. (2008b), dans leur article qui porte bien son nom "Make Trade Not War", montrent que le début de la guerre diminue grandement la valeur des biens échangés, impliquant par là même que les relations commerciales créent des coûts d'opportunité plus élevés pour la guerre, en même temps minimisant la probabilité d'un conflit. Dans Martin et al. (2012) ils vont ensuite montrer que cet effet peut être institutionnalisé par la formation d'un accord commercial dans un certain laps de temps après un conflit. Vicard (2012) constate que l'intégration économique profonde entre les pays réduit considérablement leur probabilité de conflit, tandis que les accords peu profonds ne le font pas. Lederman and Ozden (2007) montrent comment les intérêts géopolitiques des États-Unis, tel qu'ils sont exprimés par des alliances politiques, sont joués contre un accès préférentiel au marché américain. Berger et al. (2013) révèlent un autre aspect du mélange des intérêts politiques et commerciaux en montrant comment les interventions de la CIA conduisent à une augmentation des importations américaines du pays touché.

Naturellement, l'interaction entre la politique commerciale et la politique étrangère a également été étudiée du point de vue de la science politique. Waltz (1999) et Nye (1988, 2011) dépeignent la pensée des deux écoles de pensée les plus éminentes à cet égard: l'école du réalisme et de celle du (néo)libéralisme. D'autres ont établi le lien entre la politique intérieure et les accords commerciaux: Mansfield et al. (2002) montrent que les accords commerciaux génèrent des informations qui aident les dirigeants à « montrer à leurs électeurs » leurs réalisations au cours de leur mandat. Liu and Ornelas (2014) trouvent d'autres preuves de cette hypothèse, montrant que les accords commerciaux peuvent servir de dispositif d'engagement dans le but de stabiliser un régime démocratique (Maggi, 2014). Cela entre en résonance aussi avec les résultats de Mansfield et al. (2000), qui démontrent les caractéristiques communes des signataires des accords commerciaux: les démocraties établissent des barrières commerciales bilatérales à des niveaux inférieurs à celles des autocraties.

Le chapitre 1 contribue à la littérature économique en cherchant à démontrer qu'à côté des motivations traditionnelles, certains accords d'intégration économique peuvent aussi avoir leurs déterminants politiques. Construit sur une version modifiée du modèle présenté par Limão (2007), je montre comment, dans un cadre stylisé, un grand pays peut peser de motivations alternatives pour l'intégration—économique ou politique—alors qu'un petit pays peut être indifférent entre les pays partenaires possibles. Je teste ces prédictions avec les proxies pour des motivations économiques et politiques pour l'intégration. La motivation économique est approximée par des gains commerciaux *non-réalisés* en utilisant des contrefactuels d'équilibre général à partir d'un cadre de gravité introduit plus en détail dans le chapitre 2. Dans l'estimation, un indice de profondeur de l'intégration représente l'hétérogénéité de l'intégration. La motivation politique est approximée par deux nouveaux indices pour décrire l'état des relations politiques entre les deux pays—*importance* et *mood* politique bilatérale— exploitant les pouvoirs des données GDELT (Leetaru and Schrod, 2013). Cette base de données puissante de plus de

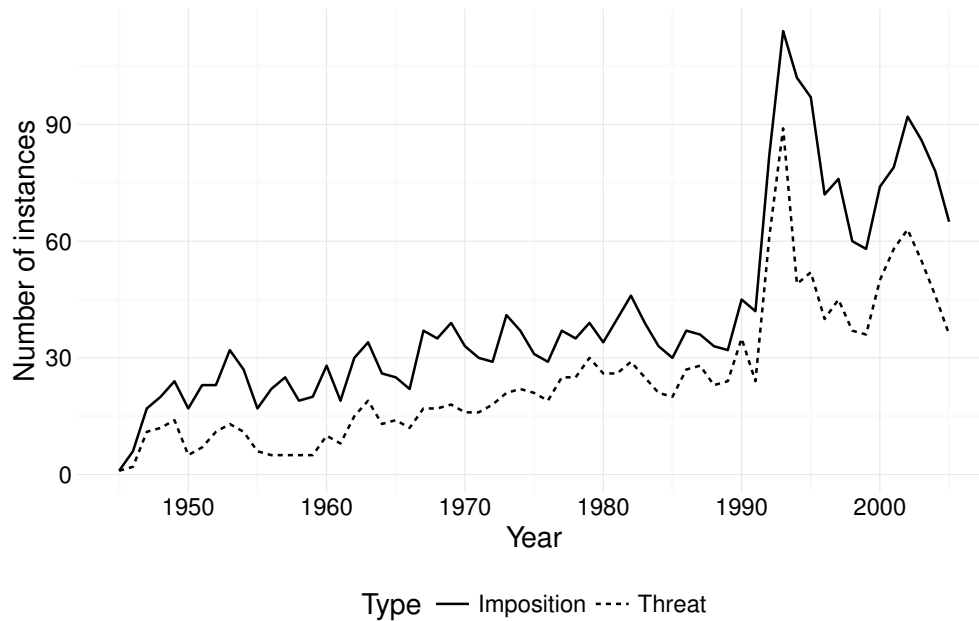


Figure 2: Compte de l'imposition et la menace de sanctions au fil du temps (Source: Morgan et al. (2009))

300 millions d'événements politiques me permet de construire des proxies directionnelles pour les relations politiques, une amélioration de proxy actuellement le plus populaire, la corrélation des votes de l'assemblée générale de l'ONU par Voeten and Merdzanovic (2009).

Effets des sanctions sur les pays sanctionnant

La politique commerciale au service de la politique étrangère ne peut fonctionner que grâce à la facilitation du commerce et à l'abaissement des barrières existantes. Au contraire, pour les forts liens commerciaux existants, ériger de nouvelles barrières est devenu un instrument populaire pour parvenir à un objectif de politique étrangère (Kaempfer and Lowenberg, 2007). Les « smart sanctions », interdiction de voyager ou gel des avoirs, les sanctions économiques plus sévères et les embargos, sont quelques-uns des outils favoris actuels de la politique étrangère. Le

graphique 2 indique le nombre de cas par an dans lequel une mesure de sanction a été soit menacée (ligne pointillée) ou imposée (ligne pleine), ou a continué à être ainsi. Morgan et al. (2009) fournit une base de données qui montre une augmentation continue de la popularité de l'utilisation de sanctions avec un énorme pic de cas à partir du début des années 1990.

La raison d'être des sanctions économiques est simple: elles sont conçues pour punir le pays cible en infligeant des dégâts sur son économie par des restrictions ou des interdictions sur le commerce de certains biens et services, rupture des liens financiers, ou un embargo tous azimuts. Les sanctions sont souvent utilisées lorsque la diplomatie échoue et que des options militaires semblent trop drastiques. Un avantage supplémentaire réside dans le fait que les mesures sont généralement facilement affinées et peuvent être levées rapidement. Toutefois, les sanctions ne sont pas gratuites: pour l'économie du pays sanctionnant, certaines restrictions peuvent constituer des obstacles au commerce car effectuer des transferts transfrontaliers de biens et de l'argent sont plus difficiles.

Le but du chapitre 2 est d'enquêter sur ces coûts de sanctions sur l'économie des pays *expéditeurs*. Nous analysons le cas récent du conflit diplomatique entre les pays occidentaux et la Fédération de Russie à partir de Mars 2014. Dans l'ensemble, 37 pays occidentaux, y compris tous les pays de l'UE, les États-Unis et le Japon, ont imposé des sanctions économiques à la Fédération de Russie sur l'implication dans la crise politique et militaire en Ukraine. Après l'annexion de la Crimée par la Russie en Mars 2014, ces 37 pays ont mis en place des sanctions sur la Fédération de Russie, qui ont été renforcées en Juillet 2014. La Russie a alors riposté en imposant un embargo sur certains produits alimentaires et agricoles. Le cas des sanctions russe est particulièrement instructif en raison de la force des liens économiques pré-sanction. En 2012, la Russie comptait pour environ 2,3 % des exportations de tous les pays sanctionnant et 63,8 % des exportations russes étaient destinées aux pays sanctionnant.

Le chapitre 2 se compose de deux parties distinctes. Nous évaluons d'abord les effets globaux dans un cadre de gravité et montrons que l'impact a été assez hétérogène entre les pays sanctionnant impliqués. L'analyse est effectuée à l'aide des données mensuelles de UN Comtrade pour 78 pays. Pour tenir compte des effets d'équilibre général des mesures mises en place, nous effectuons une analyse contrefactuelle d'équilibre général suivant Dekle et al. (2007, 2008) et Anderson et al. (2015). Ceci nous permet d'estimer précisément la perte des exportations vers la Russie suite au conflit militaire en Ukraine, les sanctions occidentales, et les représailles russes. Afin d'obtenir une meilleure compréhension des causes profondes de cet impact global, nous étudions ensuite comment les entreprises ont réagi aux sanctions en utilisant un riche ensemble de données mensuelles des exportations au niveau des entreprises françaises. Nous estimons les effets sur les marges intensives et extensives et examinons les canaux possibles par lesquels les exportations des entreprises sont touchées. Enfin, nous analysons si les entreprises ont pu récupérer une partie de leurs pertes subies en détournant leurs ventes à d'autres destinations.

Mis à part les travaux décrits ci-dessus à l'étude de l'intersection de la politique et le commerce, l'utilisation des sanctions comme un outil de la politique étrangère a suscité une littérature substantielle à la fois en sciences politiques et en économie. La majeure partie du travail existant a mis en lumière les déterminants de la réussite ou de l'échec de ces politiques et de l'effet des sanctions sur l'économie *cible* à travers laquelle le résultat escompté—changement de certaines politiques—est censé réussir. Drezner (1999), van Bergeijk (2009) et Hufbauer et al. (2009) fournissent des aperçus instructifs sur l'état de la recherche dans ce domaine. Récemment, de soi-disant « smart sanctions » sont devenues plus populaires, tendant à réduire le fardeau sur la population générale d'un pays ciblé en visant directement les mesures à l'élite dirigeante d'un pays. Rosenberg et al. (2016) et Drezner (2011) fournissent des analyses pertinentes de ce type de mesure.

En termes d'analyses économiques empiriques, Hufbauer et al. (2009) restent une contribution influente avec un dossier complet des cas de sanctions, avec un focus sur les sanctions imposées par les États-Unis et les pays européennes. TIES, la base de données la plus récente et la plus détaillée par Morgan et al. (2009) englobe cependant davantage de pays expéditeurs et cibles. Les deux ensembles de données fournissent des mesures quantitatives sur la portée et l'intensité des mesures appliquées, et tentent de juger de leur succès ou échec par rapport à leurs objectifs politiques. Il est important de préciser que dans le chapitre 2 nous nous abstenons de déclarer si les sanctions sur la Russie « sont réussies » dans le sens de la réalisation de leurs objectifs politiques, et on se concentre sur l'impact de ces nouvelles barrières d'échange sur les exportations des pays *expéditeurs* des sanctions.

Le chapitre contribue à une littérature relativement petite mais en croissance constante, qui étudie l'impact économique, indépendamment du succès politique ou non, des sanctions. Pour des raisons évidentes, la plupart de ces travaux se concentrent sur l'effet dans le pays cible. L'étude de Dreger et al. (2015) est en relation directe avec notre travail, évaluant l'impact macroéconomique du régime de sanction entre les pays occidentaux et la Fédération de Russie. Les travaux antérieurs qui ont porté sur le cas de la Loi sur l'embargo de 1807, adoptée sous la présidence de Jefferson, visait à forcer la France et la Grande-Bretagne à reconnaître la neutralité des États-Unis. Il a été largement considéré comme infructueux (Findlay and O'Rourke, 2007), mais constitue la première utilisation de sanctions et d'embargos à l'époque moderne. Frankel (1982), Irwin (2005), et O'Rourke (2007) trouvent des effets autour de 4–8 % du PIB américain sur les pertes commerciales et les changements de prix des matières premières. Dans une étude plus générale, Caruso (2003) estime les effets moyens des sanctions sur le commerce global des flux dans la seconde moitié du 20^e siècle dans un cadre de gravité dite maintenant *naïve* (Head and Mayer, 2014).

Après avoir mesuré les effets globaux des sanctions sur la Russie, dans la dernière partie du chapitre 2 nous étudions l'impact des sanctions au niveau des entreprises. Analysant le cas des sanctions occidentales imposées à l'Iran, Haidar (2014), employant une approche très similaire à la nôtre, étudie l'impact des sanctions sur les entreprises iraniennes à l'aide de données au niveau des transactions. L'étude de la réaction des entreprises au régime des sanctions lie notre travail à la littérature très active sur la dynamique des exportateurs dans des environnements en évolution rapide répondant aux chocs économiques. Dans un ouvrage récent, Berman et al. (2012) trouvent une réaction hétérogène des entreprises françaises aux fluctuations des taux de change réels, une autre composante des coûts commerciaux qui influence les comportements des entreprises. Berman et al. (2015) montrent que la connaissance de la demande locale—approximée par l'âge et l'expérience de l'entreprise—semble être un mécanisme clé de la dynamique des exportateurs. Dans le même ordre, Bricongne et al. (2012) identifient les contraintes de crédit comme un facteur aggravant pour les entreprises actives dans les secteurs où la dépendance financière est élevée face à un choc soudain.

Notre étude se distingue de la littérature existante sur les sanctions en mettant l'accent sur l'impact des sanctions dans la perspective de l'économie du pays *expéditeur*. Ce faisant, nous mettons l'accent sur l'importance des éventuels « dommages collatéraux » de ces outils diplomatiques, à savoir, les coûts que les pays de sanction peuvent s'infliger à eux-mêmes. Nous contribuons également à la littérature sur la dynamique des exportateurs en mettant en évidence l'impact du choc au financement du commerce par le biais des sanctions financières en tant que mécanisme clé.

Nous évaluons l'effet du régime de sanctions vis-à-vis de la Fédération de Russie à partir de deux angles. En utilisant des données mensuelles de UN Comtrade, nous évaluons l'impact global sur les exportations vers la Fédération de Russie par tous les principaux partenaires commerciaux—

sanctionnant ou pas—dans un cadre de gravité structurelle. Nous trouvons que les coûts globaux américains s'élèvent à \$ 60,2 milliards du début du conflit jusqu'à la mi-2015, avec 76,7 % encourus par les pays de l'UE. Fait important, les produits qui sont visés par l'embargo russe ne représentent qu'une petite fraction de la perte totale. Ceci suggère que la plupart de l'impact du conflit diplomatique sur les exportations peut être considéré comme des dommages collatéraux. Nous affinons notre analyse dans une perspective microéconomique en utilisant des données mensuelles au niveau des entreprises françaises et nous évaluons les effets sur les entreprises françaises. Nous constatons que les sanctions ont diminué la probabilité d'exporter vers la Russie, la valeur des expéditions, et le prix par l'entreprise individuelle. En outre, entre les boycotts, risque pays, et le financement du commerce, celui-ci se trouve à mieux expliquer la baisse marquée dans les exportations des entreprises françaises.

La politique de chaînes de valeur mondiales

Le chapitre 3 analyse la connexion entre la politique et le commerce d'un autre angle. Au lieu de regarder comment la politique commerciale est façonnée par des objectifs politiques, soit par des accords d'intégration économique comme dans le chapitre 1, soit par les sanctions décrites au chapitre 2, nous analysons dans un travail commun avec Elsa Leromain comment les différents produits peuvent réagir à des chocs sur les relations politiques. La prolifération des chaînes de valeur mondiales, les liens transfrontaliers entre les entreprises, ont rendu la production nationale de marchandises dépendantes des inputs provenant de sources étrangères. Si les relations politiques entre les deux pays venaient à s'aggraver pour une raison quelconque, il est probable que les échanges entre les entreprises de ces pays soient soumis à des coûts commerciaux plus élevés. Cela pourrait se produire grâce à des mesures directes drastiques, par exemple l'augmentation des tarifs ou la suspension des accords commerciaux préférentiels, ou d'une manière plus subtile grâce à une augmentation des

contrôles à la frontière, par exemple comme dans (Beestermöller et al., 2016), ou des instruments de financement du commerce plus coûteux, comme dans le chapitre 2.

Dans ce chapitre, nous analysons le lien entre les relations politiques et commerciales au niveau de l'industrie, ce qui permet un effet hétérogène par types d'input. Le principal mécanisme que nous supposons dans la conduite de l'hétérogénéité est la *dépendance* de l'économie sur les inputs importés. Nous pensons que les relations politiques entre les pays sont plus importantes pour les biens *critiques* de l'économie importatrice. Nous suivons Ossa (2015) dans le libellé, qui, à l'étude de l'hétérogénéité de la réponse des importations aux tarifs des Etats, déclare que « [...] les importations dans certaines industries sont *critiques* (essentielles) au fonctionnement de l'économie, de sorte que un arrêt complet du commerce international est très coûteux globalement » (Ossa, 2015, p. 266). En tant que tel, nous définissons les biens essentiels et des inputs ceux qui sont utilisés de façon intensive directement et indirectement pour la production de biens qui sont consommés dans le pays.

Mis à part la littérature examinée ci-dessus, le chapitre est lié à une littérature réduite mais active sur la diplomatie et le commerce. D'une manière générale, les changements dans les relations diplomatiques semblent avoir un assez court terme, mais un impact significatif. Rose (2007) montre que la représentation diplomatique peut favoriser le commerce: il estime que chaque mission étrangère supplémentaire augmente les exportations de 6–10 %. Nitsch (2007) montre que les visites officielles de chefs d'Etat accroissent, en moyenne, les exportations de 8–10 %. Cependant, ces résultats sont très sensibles au type de visites et beaucoup moins robuste pour les importations. Fuchs and Klann (2013), aussi brièvement mentionné ci-dessus, estiment l'effet des visites à l'étranger du Dalaï Lama sur le commerce des pays d'accueil avec la Chine. Ils trouvent seulement un effet significatif pour des réunions avec de hauts dirigeants politiques des pays et seulement pour la période de 2002 à 2008, et l'effet

ne dure également qu'un an. Davis et al. (2012) soupçonnent un impact hétérogène des relations politiques, mais dans leur cas, l'hétérogénéité vient du type de l'entreprise. Ils estiment l'effet des relations politiques sur les importations et les exportations des entreprises d'Etat (SOE). L'idée étant que les gouvernements influencent directement le comportement des entreprises, et ils constatent en effet que les événements politiques bilatéraux défavorables conduisent à une réduction des importations et des exportations. Cet impact est plus fort pour les importations par les entreprises publiques, mais donne des résultats mitigés pour les exportations. Mityakov et al. (2012) mettent l'accent sur l'hétérogénéité de l'impact entre les secteurs et motivent ceci par la « sécurité énergétique ». Ils montrent qu'une diminution d'un écart-type de la distance politique, telle que mesurée par la similitude du vote de l'Assemblée générale de l'ONU, est associée à une diminution de 14 % des importations américaines.

Dans la première partie du chapitre, nous développons un modèle théorique simple qui illustre le mécanisme. Suivant un modèle de Acemoglu et al. (2012) sur la propagation des chocs financiers dans une économie, la raison d'une plus grande importance des tensions politiques pour les importations d'inputs essentiels est qu'un choc pour leur prix a un plus grand impact sur la production totale d'une économie d'un choc pour les autres inputs importés.

Dans l'analyse empirique nous testons la prédiction théorique du modèle sous forme réduite. Un sujet de préoccupation dans la littérature courante qui estime les effets des relations politiques est la question de l'endogénéité. Les travaux existants ont abordé cette question avec une variété de différentes stratégies afin de contourner l'endogénéité des relations politiques et des résultats économiques. Une telle stratégie est lancée par Kuziemko and Werker (2006), qui exploitent la rotation des membres non-permanents du conseil de sécurité de l'ONU pour évaluer le lien entre l'aide étrangère et un soutien politique à des organisations internationales. Dans une approche plus proche de la nôtre, Fisman et al. (2014)

poursuivent une autre stratégie et réalisent une étude d'événement. Ils analysent les performances des entreprises japonaises et chinoises avec une exposition sur l'autre marché respectif après des épisodes nationalistes, suite à la publication d'un manuel d'histoire révisionniste au Japon et une quasi-collision d'un chalutier chinois avec un navire de la Garde côtière japonaise.

Pour répondre à la question de l'endogénéité dans le cas présent, nous explorons l'effet sur les échanges commerciaux provoqués par des chocs politiques *exogènes*. Nous exploitons la convocation ou le rappel de l'ambassadeur (ou autres hauts membres du personnel diplomatique) d'un pays comme un choc négatif exogène des relations politiques bilatérales pour étudier la façon dont les flux commerciaux réagissent.

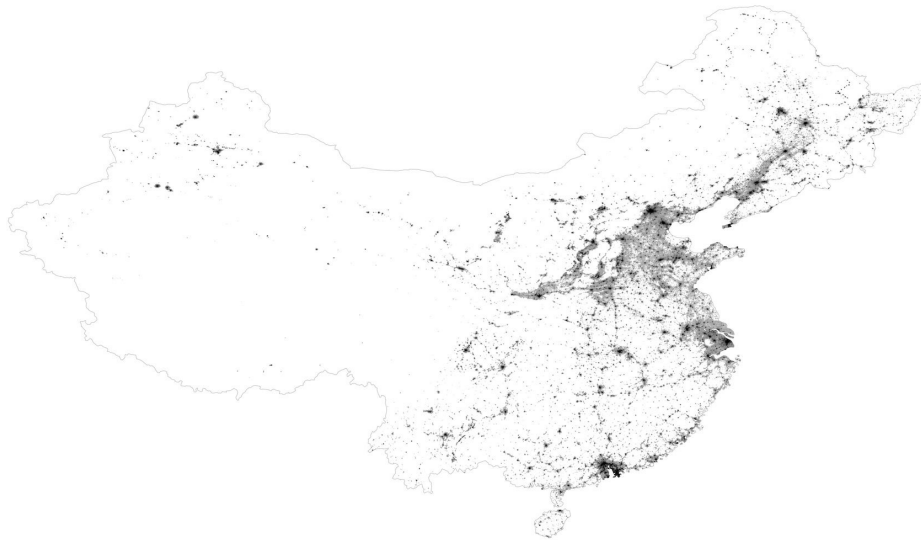
Pour cela, nous construisons une nouvelle base de données d'événements en recueillant des informations sur ces événements de communiqués de presse trouvés sur les sites internet des ministères des Affaires étrangères des cinq principaux acteurs en termes d'économie et de politique: la France, le Royaume-Uni, la Russie, l'Allemagne et le Japon. Nous utilisons ensuite ces événements comme une proxy pour un choc négatif sur les relations politiques bilatérales dans une configuration d'équation de gravité, similaire à Fuchs and Klann (2013). Cette stratégie nous permet de contrôler pour divers effets locaux qui pourraient biaiser les estimations. Comme dans le chapitre 2, nous utilisons des données de UN Comtrade *mensuel* (United Nations Statistics Division, 2015), mais cette fois sur les importations des cinq pays vis-à-vis du reste du monde de Janvier 2010 à Décembre 2014.

Les résultats de l'exercice empirique soutiennent le mécanisme proposé dans la partie théorique du chapitre. Les relations politiques ont un impact sur le commerce, et d'autant plus pour les produits essentiels, à savoir ceux dont l'économie importatrice dépend.

Distances variant dans le temps dans le modèle de gravité

Comme évoqué précédemment, dans tous les chapitres, je fais usage du modèle de gravité du commerce international d'une manière ou d'une autre. Dans le chapitre 4 je contribue à cette littérature plus directement en montrant comment une configuration de gravité structurel générique peut (et doit) être utilisée pour agréger les coûts commerciaux. En utilisant cette agrégation cohérente avec la théorie, je calcule les distances entre et au sein des pays. De plus, en utilisant l'imagerie par satellite sur l'émission nocturne de lumière, je tiens compte des changements de la géographie économique du pays pour produire une mesure de distance variant dans le temps. L'utilisation de ces distances est intéressante et potentiellement importante à deux égards: la variation dans le temps peut être utilisée pour estimer l'élasticité du commerce à la distance dans la dimension transversale d'un panel, en contrôlant pour les caractéristiques inobservables des paires de pays. Dans le chapitre, il est en outre montré que l'utilisation de ces distances est potentiellement important lors de l'estimation des effets frontière, ce qui réduit l'ampleur de « l'énigme de la frontière » jusqu'à 63 %.

Ce chapitre, se fondant sur les travaux antérieurs de Head and Mayer (2009), vise à fournir une agrégation des coûts commerciaux qui découlent d'une représentation très générale de l'équation de gravité, tout en restant agnostique quant à ses fondements microéconomiques. Lorsque concerné avec les déterminants du volume des flux de marchandises, les économistes du commerce ont souvent recours à des chiffres agrégés du commerce, par pays, ou parfois l'état et la province. Cela rend une agrégation de ses déterminants tout aussi nécessaire. Dans le même temps, toute agrégation spatiale doit tenir compte de la géographie économique de l'entité agrégée. Toutefois, les données sur la répartition spatiale de l'activité économique sont difficiles à trouver, mais ces dernières années des données d'émission



(a)



(b)

Figure 3: La distribution de la lumière émise dans la nuit en Chine en 1992 (a) et en 2012 (b).

de lumière enregistrées dans les heures du soir par satellite sont devenus un proxy populaire (Henderson et al., 2011). Les graphiques 3a et 3b montrent la répartition de la lumière émise dans la nuit en Chine en 1992 et 2012. Deux points ressortent: d'abord, les régions côtières urbaines semblent avoir augmentées énormément en taille; Deuxièmement, les

régions de l'extrême Ouest, Sud-Ouest et du Nord-Est se sont développées au-delà de la moyenne. Les deux graphiques soulignent l'importance de la prise en compte de l'évolution de la géographie économique au fil du temps.

Le chapitre 4 est bien sûr lié à une ample littérature sur l'effet de la distance sur le commerce, sans doute l'une des relations les plus persistantes dans l'économie (Head and Mayer, 2014). Bien qu'il ait été quelque peu façonné pour déclarer « mort » à la suite de la mondialisation, les économistes du commerce sont venus à la rescousse et ont montré qu'il est en effet « bien vivant » (Disdier and Head, 2008). La distance elle-même est toutefois une proxy pour diverses barrières commerciales: les coûts de transport, les barrières linguistiques qui ont tendance à être corrélées avec la distance culturelle, informationnelle et même la distance génétique. Certains d'entre eux peuvent être pris en compte dans les estimations de l'équation de gravité avec des variables de contrôle, tandis que d'autres sont plus difficiles à identifier ou encore « inexplorés ». Disdier and Head (2008) et Head and Mayer (2014) fournissent une méta-analyse de l'effet de la distance sur le commerce et sa persistance un peu déroutante. L'effet est dit déroutant, parce qu'il a été montré que le coefficient estimé a augmenté au fil du temps, selon la technique de régression et les données utilisées. La pensée commune d'autre part a ce que le monde connaît actuellement, une « Death of Distance », comme par exemple dans le livre de Friedman (2005) « The World is Flat ».

Une des difficultés pour estimer correctement l'effet « réel » de la distance est qu'il est probablement en corrélation avec les caractéristiques de paires de pays bilatéraux inobservés. Pour isoler l'effet non biaisé de la distance sur le commerce, deux articles récents exploitent la variation des distances maritimes dans des expériences quasi-naturelles en raison d'événements exogènes. Cette stratégie leur permet d'inclure les effets fixes des paires de pays qui capturent ces caractéristiques corrélées et non observées. Feyrer (2009) utilise la fermeture du canal de Suez à partir

de 1967, qui commence avec la guerre des Six Jours, et se termine par la guerre de Yom Kippour huit ans plus tard comme traitement. Hugot and Umana Dajud (2014) effectuent une analyse similaire, l'estimation de l'effet des ouvertures initiales du canal de Suez en 1869, ainsi que celle du canal de Panama en 1914 dans un modèle de gravité structurelle. Les deux articles supposent que la géographie économique des pays de négociation est statique, mais que les routes optimales entre les pays changent en raison de l'événement exogène.

Le chapitre 4 contribue également à la littérature concernée par l'effet des frontières sur le commerce. L'effet frontière a d'abord reçu une attention considérable après McCallum (1995), qui a remarqué un casse-tête apparent: les flux commerciaux en moyenne entre les provinces canadiennes sont 22 fois plus grands que les flux commerciaux moyens d'une province canadienne à un état des États-Unis. L'ampleur de l'effet a attiré un examen plus approfondi. Une grande part de la résolution du puzzle a été fournie par Anderson and van Wincoop (2003). Ils ont montré que l'omission de ce qu'ils ont nommé le terme de résistance multilatérale, les obstacles au commerce qui touchent tous les partenaires commerciaux, a donné lieu à un biais de l'estimation de la gravité. La comptabilisation de ces termes de résistance multilatéraux fait tomber le facteur interne à l'égard du commerce extérieur qui passe à un facteur d'environ 5. La littérature a depuis encore évolué et étudié la question à différents niveaux d'agrégation des données et sur de nombreuses entités géographiques. Même les subdivisions intra nationales semblent entraîner des effets transfrontaliers: Ishise and Matsuo (2015) trouvent un effet entre les états de tendance démocratique et républicaine aux États-Unis, Felbermayr and Gröschl (2014) le long de l'ancien Sud et Nord des États-Unis, tandis que Wolf (2009) et Nitsch and Wolf (2013) trouvent un effet de frontière persistant le long de l'ancienne division Est-Ouest de l'Allemagne. Coughlin and Novy (2013) combinant des données sur les flux commerciaux des États-Unis interne et externe, trouvent, de façon surprenante, l'effet intra national de la frontière semble être encore plus grande que celui de la

frontière internationale. Poncet (2003) trouve un effet similaire pour la Chine.

Un certain nombre d'auteurs ont lié la grande énigme de l'effet frontière au choix de la mesure de distance. Helliwell and Verdier (2001) ont d'abord noté l'importance de la mesure de la distance interne correcte pour l'estimation de l'effet frontière. Dans un effort plus lié à ce chapitre, Head and Mayer (2009) suggèrent la moyenne harmonique comme mesure de la distance « efficace » et sont les premiers à montrer le biais potentiel de l'utilisation d'autres mesures sur l'effet frontière estimé dans des simulations. Hillberry and Hummels (2008), en utilisant des données microéconomiques du « Commodity Flow Survey », montrent que les distances au sein des Etats et entre les Etats voisins sont souvent largement exagérés. L'utilisation des distances précises au niveau du code postal à 5 chiffres révèle que l'effet frontière au niveau de l'Etat est en fait un artefact d'agrégation géographique. Coughlin and Novy (2016) enquêtent également sur les effets de l'agrégation spatiale sur l'estimation de l'effet frontière, interrogeant avec l'aide d'un modèle comment les plus grands pays signalent mécaniquement des effets de frontière plus bas que les petits pays.

La contribution de ce chapitre réside dans l'amélioration des mesures existantes le long de plusieurs axes. Tout d'abord, je tire une agrégation des coûts du commerce qui est agnostique par rapport au cadre de la gravité sous-jacente, mais donne des instructions concrètes sur la méthode de calcul et les données à utiliser; Deuxièmement, je me tourne vers l'imagerie par satellite qui fournit des informations exactes sur la localisation et une approximation de l'intensité de l'activité économique. Ceci élimine la possibilité d'une erreur humaine de mesure dans les chiffres de population et augmente radicalement la couverture aux zones pratiquement toutes habitées et économiquement actives de manière fine et détaillée. En outre, il s'éloigne d'une mesure pondérée par la population vers une mesure fondée sur le PIB, ce qui est plus compatible avec le cadre théorique de

gravité. Troisièmement, les données utilisées ont une périodicité annuelle, me permettant de calculer une série chronologique des distances pour chaque paire de pays et par année depuis 1992.

Le chapitre donne deux résultats importants. Dans la partie théorique, je montre que le coefficient de coût du commerce estimé à partir d'une équation de gravité sert également en tant que paramètre dans l'agrégation respective des coûts du commerce lui-même. Dans la partie empirique, je peux estimer le coefficient de la distance itérative tout en exploitant le temps de variation des données, contrôle des caractéristiques paires de pays inobservés.

Contribution et organisation

Cette thèse contribue à la littérature du commerce international de multiples façons. Tout d'abord, comme l'indique le titre « Essay on International Trade and Foreign Policy », je contribue à la littérature qui cherche à comprendre le lien entre la politique et le commerce. Les chapitres 1 et 3 comportent des modèles stylisés qui présentent deux mécanismes qui n'ont pas été explicitement formalisés dans la littérature. Dans le premier, je mets en lumière le mécanisme qui explique pourquoi il pourrait être bénéfique pour les grands pays de s'intégrer économiquement avec les petits pays pour des raisons géopolitiques, défiant la logique habituelle des avantages économiques. Dans le dernier, en collaboration avec Elsa Leromain, nous montrons comment des chocs symétriques de relations politiques peuvent avoir un impact hétérogène sur le commerce des biens intermédiaires importés, où certains biens sont essentiels, plus importants pour l'économie nationale dans son ensemble.

Deuxièmement, dans les chapitres 2 et 4 j'apporte deux contributions méthodologiques au modèle de gravité du commerce international. Dans le

chapitre 2, Matthieu Crozet et moi-même montrons que les contrefactuels d'équilibre général peuvent être calculés exclusivement avec les flux commerciaux observés, aucune donnée supplémentaire n'est nécessaire. Dans le chapitre 4, je tire une agrégation des coûts du commerce cohérente avec la théorie à l'aide d'un cadre de gravité structurel qui est agnostique aux fondements microéconomiques, tout en donnant le résultat important de l'élasticité du coût du commerce étant lui-même un paramètre dans l'agrégation.

Enfin, je présente plusieurs nouvelles sources de type « big data » (et « small data ») qui n'ont jusqu'à présent pas été utilisés dans la littérature sur le commerce international. Dans le chapitre 1 j'utilise les données de GDELT, un ensemble de données comprenant plus de 300 millions d'événements politiques, qui donne l'emplacement, les participants et le ton des événements qui ont eu lieu depuis 1979. Dans le chapitre 4, j'utilise l'imagerie par satellite sur les émissions de lumière, utilisée auparavant dans la littérature de croissance mais qui, à ma connaissance à ce jour, n'a pas été utilisée dans le contexte de l'économie internationale, comme proxy de l'activité économique à travers l'espace. Ce vaste ensemble de données de plus de 700 millions de lieux—environ 70 millions éclairés et sur terre—accessibles au public avec une périodicité annuelle pour toutes les années depuis 1992, me permet de calculer des distances variables dans le temps en prenant l'espace au sérieux.

Le reste de cette thèse de doctorat est structuré comme suit. Dans le chapitre 1 je centre mon analyse sur les déterminants des accords d'intégration économique. Dans le chapitre 2, Matthieu Crozet et moi-même analysons l'impact des sanctions sur la Russie sur les exportations des pays de sanction. Dans le chapitre 3, Elsa Leromain et moi-même montrons comment certains inputs importés sont plus sensibles aux relations politiques que d'autres. Enfin, dans le chapitre 4 je réponds à la question sur la façon dont les coûts commerciaux doivent être agrégés et je calcule une mesure de distance améliorée en utilisant l'imagerie par satellite.

Introduction

Trade flows, trade policy and foreign policy become increasingly intertwined in a world where globalization has created deep economic and political links between almost all countries. Foreign policy has always borne commercial interests. Roman expansionism across vast areas of the European heartland and Mediterranean and European colonial expeditions to far lands were an early manifestation of how commercial and economic interests shape policies directed to foreign entities (Findlay and O'Rourke, 2007). More often, however, foreign policy is conducted under the veil of commercial policy. Globalization, in particular in the sense of trade liberalization, has not only created a web of interdependency, but significant and critical dependencies between countries. The suspension or a mere threat of severance of trade relations, as well as the prospect of lowered barriers to trade, are readily used to pursue non-trade related policy objectives. The recent sanctions on Russian individuals and companies is only the latest chapter in recent decades of using economic leverage for political objectives. From the Cuban embargo by the United States to the granting of preferential access to the European market in the name of “Neighborhood policy”, its use has proliferated.

The subject of this doctoral thesis revolves around the analysis of these links between foreign policy and international trade, along with one chapter that is of more methodological nature. In chapter 1 I show how geopolitical interests are a key motivation for economic integration agreements (EIA). Big countries—defined in terms of GDP—systematically

negotiate and sign these agreements with smaller countries that offer political benefits at the expense of economic ones. Chapter 2 provides an empirical analysis of the effect of sanctions on sanctioning countries—their exports in particular. In this joint work with Matthieu Crozet, we study the macro-impact of the sanctions regime against the Russian Federation on export flows from Western countries and the micro-impact on French exporting firms. Sanctions being a popular instrument of foreign policy, their cost on the sanctioning economy is often overlooked. We show that this “collateral damage” can be extensive, in the case of sanctions against Russia totaling at \$3.2 billion dollars per month. Chapter 3 takes a closer look at the mechanism through which political relations between countries impact their trade flows. A collaboration with Elsa Leromain, we show how countries adjust their input sourcing pattern—their imports of intermediate inputs—to the political climate with the respective trading partner. Worsening political relations lead to a decrease in imports, in particular of those goods that are *critical* to the functioning of the domestic economy. Finally, in chapter 4 I explore the methodological issue of how trade costs *should* be aggregated from lower levels of geographic aggregation to higher ones and I compute theory-consistent country to country distances. Using nighttime satellite imagery for information on the location of economic activity, I compute time-varying distances between all countries and years since 1992. Using this measure in the estimation of a gravity equation provides another remedy to the so-called border puzzle of international trade.

Of Gravity and Politics as Dark Trade Costs

While the topics addressed in this doctoral thesis range from trade policy to economic sanctions and trade cost, there is a relatively large intersection of the literatures the chapters connect to. Then again, each of the topics addresses particular questions that place them also in very particular subfields of international trade.

All of the chapters in this thesis build to some degree on recent advances in the literature on the gravity model of international trade. The concept—borrowed from physics along with its terminology—relates the flow of goods from one place to another to the *bilateral* trade cost and the trading countries' economic masses, usually in a form that resembles their production and expenditure adjusted for by what is called the *multilateral resistance*. The concept was initially introduced by Tinbergen et al. (1962), who described the volume of trade between countries as a function of their GDPs and distance. The theoretical underpinnings of gravity have since received vast improvements with Anderson (1979), Anderson and van Wincoop (2003) and others. Head and Mayer (2014) provide an overview of the state of the art of this literature and highlight that a wide range of different micro-foundations yield what is called “structural gravity”. In this doctoral thesis I make use of several features of structural gravity. In chapters 1 and 2 structural gravity is used to compute general equilibrium counterfactuals, following Dekle et al. (2007, 2008) and Anderson et al. (2015). In chapter 2 we contribute to this strand of the literature in showing that theory-consistent counterfactuals can be computed without any further data than observed trade flows. In chapter 4 I derive a theory-consistent spatial trade cost aggregation directly from a gravity framework that is fully compatible with structural gravity.

Another facet that unites the first three chapters is their connection to the literature on the effects of politics on trade (and vice versa). Head and Mayer (2013) discuss non-traditional barriers to trade that cannot be “observed directly but [whose] presence is inferred to be huge”—hence *dark* trade costs—and largely hold historical mechanisms responsible. Ethnic networks (Rauch and Trindade, 2002) and past colonial linkages (Head et al., 2010) have been shown to have a considerable positive impact on bilateral trade. Other papers treat shared political and societal features as potential facilitators of bilateral trade. Umana Dajud (2013) studies

the impact of “political proximity” on trade flows, finding that countries ruled by governments that are similar in terms of their position on the left/right spectrum and degree of authoritarianism/libertarianism, have a greater exchange of goods. In a related work, Yu (2010) shows that democracies tend to trade more with each other. (Recent) conflict on the other hand is, unsurprisingly, destructive for economic exchanges: Glick and Taylor (2010) show the disruptive effects of war on international trade in particular and economic activity in general. Their approach—somewhat comparable to the one employed in chapter 2—relies on a gravity setup in which they quantify the losses by accounting for changes in bilateral and multilateral resistances. Martin et al. (2008a) and Martin et al. (2008b) analyze the prevalence and severity of interstate and civil wars through the lens of trade economists. They show that multilateral trade openness increases the probability of escalation with another country, while direct bilateral trade deters it. Similarly, small-scale civil wars are shown to be fueled by trade openness while it decreases the probability of large-scale strife. Yet others highlight the impact of non-war security-related issues on trade, in particular “hijacking” of shipments (Anderson and Marcouiller, 2002; Marcouiller, 2000), terrorism (Mirza and Verdier, 2008; de Sousa et al., 2009, 2010) and international piracy (Bensassi and Martínez-Zarzoso, 2012).

Another strand of this literature analyzes trade responses following sudden diplomatic “shocks”, sometimes assumed to leading to changes in consumer preferences. Fuchs and Klann (2013) show that high-level meetings with the Dalai Lama are costly for the hosting country, in the sense that bilateral trade with China is significantly reduced in the following year. In chapter 3 we take inspiration in their approach and perform an event study—the disruption of diplomatic relations—to measure the effect of politics on particular, *critical*, goods. In a related work, Michaels and Zhi (2010) show that the diplomatic clash between France and the United States over the Iraq War in 2003 reduced significantly the trade between the two countries during a short period of time. Pandya and Venkatesan

(2016) exploit scanner data to reveal that sales in the U.S. market of brands marketed to appear French, while not necessarily imported from France, were affected by this conflict. Heilmann (2016) studies the impact of various boycott campaigns, among others the boycott Danish products in some Muslim-majority countries in 2006 by using a synthetic control group methodology.

In the following, I provide a short summary of the findings of each of the four chapters of this doctoral thesis and embed them into the more specific literatures they aim to contribute to.

Geopolitical Motivations for Economic Integration

In chapter 1 I explore non-traditional motivations for economic integration, geopolitical ones in particular. Since the end of the Cold War the number of economic integration agreements (EIA) across the world has mushroomed. While certain regions had experienced integration efforts in the decades before, e.g. on the European continent, few agreements existed that following Krugman (1991) and Frankel et al. (1995) could be called “unnatural”—over long-distances with very dissimilar partnering countries.

Figures 4a and 4b provide a good display into the changing nature of country pairs that form EIAs. Since the early 1960’s the average distance and ratio of GDPs between countries in EIAs is growing and has been vastly accelerating since the 1990’s. While part of the reason for the stark increase in regional and supra-regional trade agreements seems to be grounded in obvious economic benefits, often there appears to be more than “just trade” as motivation. The connection between bilateral political relations and economic integration between partnering countries can be

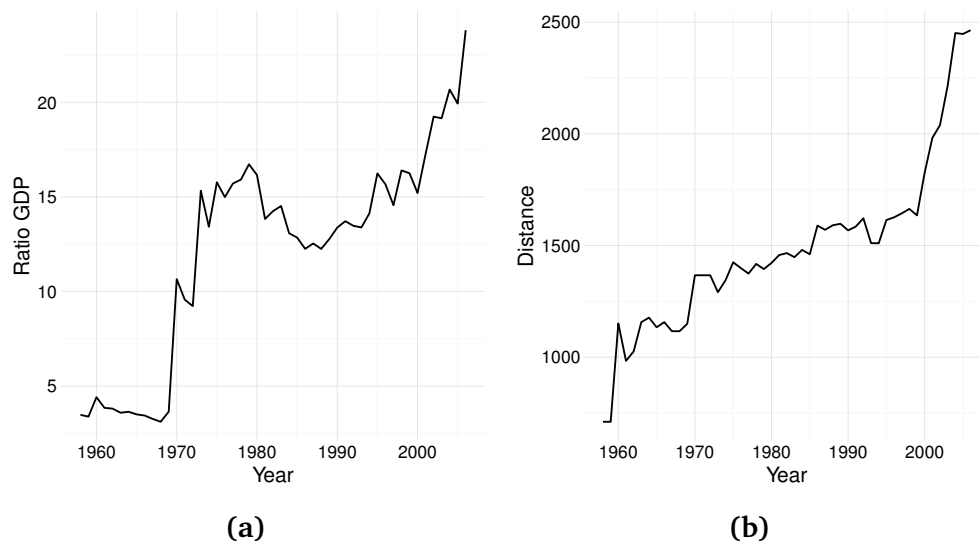


Figure 4: The average ratio of the GDP (a) and the average distance (b) between two countries in an active EIA is increasing over time.

profound, as probably best exemplified by the arguably deepest and most advanced agreement, the European Union. After two World Wars, the continent’s political leaders found themselves at a crossroads, at which economic integration was seen as the only way to “preserve and strengthen peace and liberty”, as codified in the preamble of the “Treaty Establishing the European Community”.

But the European continent is not a unique space when it comes to linking political issues with economic integration. Across the globe EIAs are formed that arguable defy direct commercial interest for the purpose of *issue linkage*: Haas (1980) argues that connecting political, commercial and other issues, creates a “regime” of international collaboration that provides rules and *fora* to settle disputes. Chapter 1 aims to address the question of how trade policy, in the form of signing a new or deepening of an existing EIA, is influenced by foreign policy considerations. Aside from traditional economic motivations, the commercial policy of economically bigger countries appears to be, at least in part, also driven by geopolitical motivations.

Next to the broader literature on the connection of politics and trade the chapter is related to an extensive literature on the determinants and effects of economic integration. Limão (2016) provides a comprehensive overview over the literature on economic and non-economic determinants of preferential trade agreements—as well as their impact on trade. In Limão (2007) he provides the benchmark model on non-traditional determinants of economic integration that incorporates a generic non-trade issue into bilateral trade negotiations and identifies the implications on multilateral trade liberalization. In the theoretical part of the chapter, I build on this model to show the mechanism through which bigger countries could be motivated to economically integrate with smaller, but politically interesting countries.

The empirical part also draws from the literature that provide analyses of economic determinants of free trade agreements. In their influential paper of Baier and Bergstrand (2007), they quantify the effect of free trade agreements on trade flows, taking into account potential endogeneity issues of selection into economic integration agreements. Vicard (2009) shows that countries tend to form various types of economic integration agreement that he finds, somewhat surprisingly, to exhibit similar trade impacts. Aichele et al. (2014), contributing to the ongoing debate on the economic and political effects of the Transatlantic Trade and Investment Partnership between the European Union and the United States, estimate the impact of economic integration across the North Atlantic on gross trade, trade in value-added and welfare in a structural gravity framework. In chapter 1 I follow this literature in estimating *non-realized* trade gains in a structural gravity framework to proxy for the economic motivation for integration.

As noted above, previous work has established links between EIAs and conflict, capturing one facet of political motivations. Following up on their previous work, Martin et al. (2012) show that the pacifying effect of trade as an opportunity cost for war can be institutionalized by forming

a trade agreement within a certain time window after a conflict. Vicard (2012) finds that deep economic integration between countries significantly reduces their probability of conflict, while shallow agreements do not. Naturally, the interaction between trade policy and foreign policy has also been studied from the perspective of political science. Waltz (1999) and Nye (1988, 2011) portray the thinking in the two most prominent schools of thought in this respect: the school of realism and that of (neo)liberalism. Others have established a link between domestic politics and trade agreements, e.g. Mansfield et al. (2002) who show that trade agreements generate information that help leaders “show their constituents their achievements” during their time in power.

Chapter 1 aims to contribute to the economic literature by seeking to demonstrate that next to traditional incentives, certain economic integration agreements may also have their political determinants. Building on a modified version of the model introduced by Limão (2007), I show how in a stylized framework a big country may weigh alternative motivations for integration—of economic or political nature—while a smaller country may be indifferent between possible partner countries at the same time. I test these predictions with proxies for economic and political motivations for integration. The economic motivation is proxied by *non-realized* trade gains computed using general equilibrium counterfactuals from a gravity framework, introduced in more detail in chapter 2. In the estimation, an index of depth of integration accounts for the heterogeneity of EIAs. The political motivation is proxied by two new indices to describe the state of political relations between two countries—bilateral political *importance* and *mood*—harnessing the powers of the GDELT dataset (Leetaru and Schrod, 2013). This powerful dataset of more than 300 million political events allows me to construct directional proxies for political relations, improving on customary measures, such as Voeten and Merdzanovic (2009)’s UN General Assembly vote similarity, to quantify the qualitative nature of political interactions.

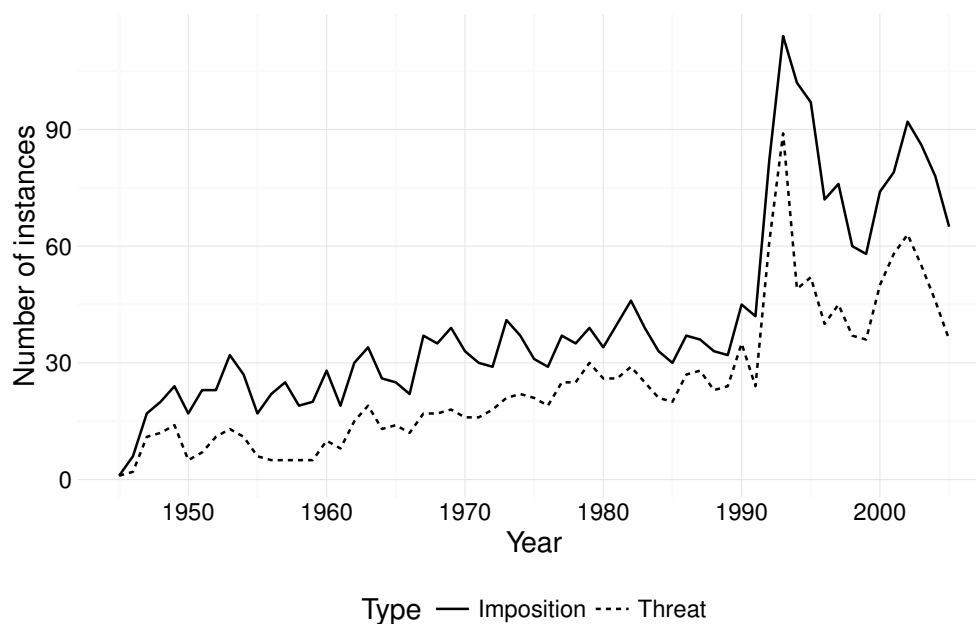


Figure 5: Count of the imposition and threat of sanctions over time (Source: Morgan et al. (2009))

Effects of Sanctions on Sanctioning Countries

Commercial policy in the service of foreign policy may not only work through facilitating trade and lowering existing barriers. On the contrary, for strong existing trade linkages, erecting new barriers has become a popular instrument to achieve a foreign policy objective (Kaempfer and Lowenberg, 2007). “Smart sanctions,” placing certain individuals under travel bans and asset freezes, along with more severe types of economic sanctions up to embargoes, are some of the current favorites in the toolbox of foreign policy. Figure 5 emphasizes this popularity by showing the number of instances per year in which a sanctions measure was either threatened (dashed line) or imposed (solid line), or continued to be so.

The rationale behind economic sanctions is straightforward: They are designed to punish the target country by inflicting damage on its economy through restrictions or bans on the trade of certain goods and services,

severance of financial ties, or an all-out embargo. Sanctions are often used when diplomacy fails yet military options appear too drastic. An added benefit is that the measures are usually easily fine-tuned and can be lifted rapidly. However, sanctions are not free: For the sender country's economy, certain restrictions may pose barriers to trade as well, making cross-border transfers of goods and money more difficult.

The aim of chapter 2 is to investigate these costs of sanctions on the *sender* country's economy. We analyze the recent case of the diplomatic conflict between Western countries and the Russian Federation beginning in March 2014. All in all, 37 Western countries including all EU countries, the United States and Japan, imposed economic sanctions on the Russian Federation over the involvement in the political and military crisis in Ukraine. After the annexation of Crimea by Russia in March of 2014, these 37 countries levied sanctions on the Russian Federation, which were further intensified in July 2014. Russia then retaliated by imposing an embargo on certain food and agricultural products. The case of the Russia sanctions is particularly instructive due to the strength of the pre-sanction economic ties: In 2012 Russia accounted for about 2.3% of all sanctioning countries' exports and 63.8% of Russian exports were destined for sanctioning countries.

Chapter 2 consists of two largely distinct parts. We first gauge the global effects in a gravity setup and show that the impact was quite heterogeneous among the sanctioning countries involved. The analysis is conducted using monthly UN Comtrade data from 78 countries. To account for general equilibrium effects of the measures put in place, we perform a general equilibrium counterfactual analysis following Dekle et al. (2007, 2008) and Anderson et al. (2015) that allows us to estimate precisely the loss of exports to Russia resulting from the military conflict in Ukraine, Western sanctions, and Russian retaliation. In order to gain a deeper understanding of the root causes of this global impact, we then study how firms reacted to

the sanctions using a rich dataset of monthly French firm-level exports. We estimate the effects on the intensive and extensive margins and examine possible channels through which firms' exports are affected. Finally, we analyze whether firms were able to partially recover their incurred losses by diverting their sales to alternate destinations.

Aside from the works described above that study the intersection of politics and trade, the use of sanctions as a foreign policy tool has attracted a substantial literature in both political science and economics. The bulk of the existent work has shed light on the determinants of the success or failure of such policies and the effect of sanctions on the *target* economy through which the intended outcome—change of certain policies—is supposed to work. In terms of empirical economic analyses, Hufbauer et al. (2009) remain an influential contribution with a thorough record of sanctions cases, with an emphasis on American- and European-imposed sanctions. The newer and more detailed TIES database by Morgan et al. (2009) however encompasses more sender and target countries. Both datasets provide quantitative measures on the scope and intensity of applied measures, and attempt to judge their success or failure with respect to their political aims. It is important to state that in chapter 2 we refrain from making a statement on whether the sanctions on Russia “work” in the sense of achieving their intended political aims and focus on the impact of these new trade barriers on the exports of the *sanctioning* countries.

The chapter contributes to a relatively small but steadily growing literature that studies the economic impact of sanctions, regardless of political success or not. For obvious reasons, most of these focus on the effect in the target country. Earlier works evaluate the case of the Embargo Act of 1807, which, enacted under President Jefferson, aimed at forcing France and Great Britain to recognize the neutrality of the United States. It has largely been deemed unsuccessful (Findlay and O'Rourke, 2007), but provided the first use of sanctions and embargoes in the modern era.

Frankel (1982), Irwin (2005), and O'Rourke (2007) find effects in the range of 4%–8% of US GDP by looking at trade losses and commodity price changes. In a broader study, Caruso (2003) estimates the average effects of sanctions on aggregate trade flows in the second half of the 20th century in a what is now coined a *naive* gravity setup (Head and Mayer, 2014).

After gauging the global effects of the sanctions on Russia, we study the firm-level impact of sanctions. Studying the reaction of firms to the sanctions' regime links our work to the very active literature on exporter dynamics in rapidly changing environments responding to economic shocks. Berman et al. (2012) find a heterogeneous reaction of French firms to real exchange rate movements, another component of trade costs that influences firms' behaviors. Berman et al. (2015) go on to show that *learning* about local demand—and hence firm age and experience—appears to be a key mechanism of exporter dynamics. Relatedly, Bricongne et al. (2012) identify credit constraints as an aggravating factor for firms active in sectors of high financial dependence when faced with a sudden shock.

This chapter sets itself apart from the existing literature on sanctions by focusing on the impact of sanctions from the perspective of the *sender* country's economy. By doing so, we shed light on the importance of possible collateral damage of this tool of foreign policy, i.e. the costs that sanctioning countries can inflict on themselves. We also contribute to the literature on exporter dynamics by highlighting the impact of the shock to trade finance through financial sanctions as a key mechanism.

We assess the effect of the sanctions regime vis-à-vis the Russian Federation from two angles: Using monthly UN Comtrade data, we evaluate the broad impact on exports to the Russian Federation by all major trading partners—sanctioning or not—in a structural gravity framework. We find the overall costs to total US\$60.2 billion from the beginning of the conflict

until mid-2015, with 76.7% incurred by EU countries. Importantly, the products that are targeted by the Russian embargo account only for a small fraction of the total loss. This suggests that most of the impact of the diplomatic conflict on exports can be considered as “collateral damage”. We then go further (and more micro) by using monthly French firm-level data and evaluate the effects on French firms. We find that the sanctions have decreased the individual firm’s probability of exporting to Russia, the value of shipments, and their price. Furthermore, between boycotts, country-risk, and trade finance, the latter is found to best explain the stark decrease in French firms’ exports.

Politics of Global Value Chains

Chapter 3 takes another angle at the connection between politics and trade. Instead of looking at how commercial policy is used for political objectives, either through economic integration agreements as in chapter 1 or sanctions as in chapter 2, in this joint work with Elsa Leromain we analyze how certain goods might react differently to shocks to political relations. The proliferation of global value chains, the cross-border linkages of firms, has made the domestic production of goods dependent on inputs from foreign sources. Should the political relations between two countries in such a value chain worsen for any given reason, it could be that trade between firms in these countries is subject to higher trade costs. This could happen through drastic direct measures, e.g. increases in tariffs or suspension of preferential trade agreements, or in a more subtle fashion through increased checks at the border, e.g. as in (Beestermöller et al., 2016), or more expensive trade finance instruments, as in chapter 2.

In this chapter we analyse the relation between political relations and trade at the industry level, allowing for a heterogeneous effect by types of inputs. The main mechanism we suspect of driving the heterogeneity is

the *dependence* of the economy on certain imported inputs. We presume that political relations between countries matter more for *critical* goods of the importing economy. We follow Ossa (2015) in the wording, who, studying the heterogeneity of the response of imports to tariffs, states that “[...] imports in some industries are critical to the functioning of the economy, so that a complete shutdown of international trade is very costly overall” (Ossa, 2015, p. 266). As such, we define as critical goods and inputs those that are imported and used intensively directly and indirectly for the production of goods that are domestically consumed.

Aside from the literature reviewed above, the chapter is related to a relatively small but active literature on diplomacy and trade. Generally speaking, shifts in diplomatic relations appear to have a rather short term, but significant impact. Fuchs and Klann (2013), as briefly mentioned above, estimate the effect of foreign trips of the Dalai Lama on the host countries’ subsequent trade with China. They find a significant effect for meetings with the countries’ top political leaders, but only for the period of 2002–2008, while the effect also only lasts one year. As we do, Davis et al. (2012) suspect a heterogeneous impact of political relations, but in their case by ownership type of the trading firm. They estimate the effect of political relations on imports and exports of state-owned enterprises (SOE). This impact is stronger for imports by SOEs relative to other firms, but yields mixed results for exports. Mityakov et al. (2012) document a pattern similar to what we suspect to drive the heterogeneous impact of politics on trade, emphasizing heterogeneity across sectors and the motivation of “energy security”. They show that a one standard deviation decrease in political distance, as measured through similarity of UN General Assembly voting, is associated with a 14 % decrease in US imports.

In the first part of the chapter we develop a simple theoretical model that illustrates the mechanism. Loosely following a model by Acemoglu et al. (2012) on the propagation of financial shocks in an economy, the rationale

for a greater importance of political tensions for imports of critical inputs is that a shock to the price of these inputs has a greater impact on the total production of an economy than a shock to other imported inputs. Useful for the empirical analysis is that we can directly derive a measure of *dependence* for each country-product pair from the model.

In the empirical analysis we test the theoretical prediction of the model in reduced form. A common point of concern in the literature is the estimation of the effects of political relations on trade in cross-section analyses and the connected issue of endogeneity. Existing works have addressed this issue with a variety of different strategies in order to circumvent the endogeneity of political relations and economic outcomes. In an approach close to ours, Fisman et al. (2014) perform an event study. They analyze the performance of Japanese and Chinese firms with exposure in the respective other market after nationalist episodes following the publication of a revisionist history textbook in Japan and a near-collision of a Chinese trawler with a Japanese coast guard vessel.

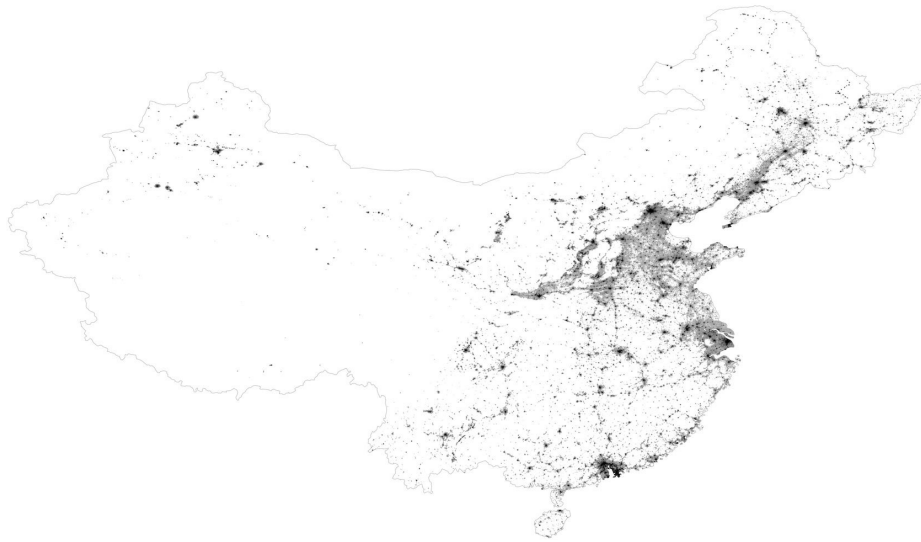
To address the issue of endogeneity in our case, we exploit the summoning or recalling of the ambassador (or other high-ranking members of the diplomatic staff) of a country as an exogenous negative shock to bilateral political relations to study how trade flows react. For this, we construct a new event database by collecting information on these events from press releases found on the websites of the foreign ministries of five lead actors in terms of economics and politics: France, UK, Russia, Germany and Japan. We then use these events as a proxy for a negative shock to bilateral political relations in a gravity setup, similar to Fuchs and Klann (2013)'s strategy, that allows us to control for various local effects that might confound the estimates. As in chapter 2, we use *monthly* UN Comtrade data, however in this case on imports of the five countries vis-à-vis the rest of the world from January 2010 to December 2014.

The results from the empirical exercise support the proposed mechanism outlined in the theoretical part of the chapter. Political relations indeed do matter in the choice of the sourcing partner for today's interdependent economies and, importantly, more so for critical products, i.e. those the importing economy is dependent on.

Time-varying Distances in the Gravity Model

As discussed above, in all of the chapters above I make use of the gravity model of international trade in one way or another. In chapter 4 I contribute to this literature more directly by showing how a generic gravity setup can (and should) be used to aggregate trade costs. Using this theory-consistent aggregation I compute distances between and within countries. Further, using satellite imagery on nighttime light emissions I account for changes to the economic geography of countries and produce a time-varying distance measure. The use of these distances is interesting and potentially important in two respects: It is interesting in that the time variation can be used to estimate the elasticity of trade to distance in the *within* dimension of a panel, that is, controlling for unobservable country pair characteristics. In the chapter it is further shown that the use of these distances is potentially important when estimating border effects, reducing the magnitude of the “border puzzle” by up to 63 %.

This chapter, building on earlier work by Head and Mayer (2009), sets out to provide an aggregation of trade costs that is derived from a very general representation of the gravity equation, while remaining agnostic to its micro-foundation. When concerned with the determinants of the volume of flows of goods, trade economists often have to resort to aggregate trade figures, by country, or sometimes state and province. This makes an aggregation of its determinants equally necessary. At the same time, any spatial aggregation has to take into account the economic geography



(a)



(b)

Figure 6: Distribution of emitted light at night in China in 1992 (a) and 2012 (b).

of the entity being aggregated. While data on the spatial distribution of economic activity is difficult to find, in recent years data on light emissions recorded in the evening hours by satellite has become a popular proxy (Henderson et al., 2011). Figures 6a and 6b show the distribution of light emitted at night in China in the years 1992 and 2012. Two observations

stand out: First, the urban coastal regions appear to have grown in size enormously; Second, regions in the far west, southwest and northeast of the country have developed more than average as well. The two figures underline the importance of taking into account changes of the economic geography over time.

Chapter 4 is related to a long literature on the effect of distance on trade, arguably one of the most persistent relations in economics (Head and Mayer, 2014). While it has been somewhat fashioned to declare it “dead” as the result of globalization, trade economists have come to the rescue and shown that it indeed is “alive and well” (Disdier and Head, 2008). Distance itself is however only the proxy for various trade barriers: Transportation costs, language barriers that tend to be correlated with distance, cultural, informational and even genetic distance. Some of these can be accounted for in estimations of the gravity equation with control variables, while others are more difficult to identify or still “unexplored” (Head and Mayer, 2013).

One difficulty in properly estimating the “true” effect of distance is that it is likely correlated with unobserved bilateral country pair characteristics. To isolate the unbiased effect of distance on trade, two recent papers exploit the variation of maritime distances in quasi-natural experiments due to exogenous events. This strategy allows them to include country-pair fixed effects in their estimations that capture these unobserved characteristics. Feyrer (2009) uses the closing of the Suez canal starting in 1967 with the Six Day War and ending with the Yom Kippur War eight years later as the treatment. Hugot and Umana Dajud (2014) perform a similar analysis, estimating the effect of the initial openings of the Suez canal in 1869 as well as that of the Panama canal in 1914 in a structural gravity model. Both papers assume that the economic geography of the trading countries is static, but that optimal routes between countries change due to the exogenous event. In this chapter I implicitly assume the con-

verse: I assume the economic geography to be changing over time, while the routes—approximated by the so-called great circle distance between locations—are invariant over time.

Chapter 4 also contributes to the literature concerned with the effect of borders on trade. The border effect first received widespread attention after McCallum (1995), who noticed an apparent puzzle: Average trade flows between Canadian provinces were a staggering 22 times larger than the average trade flow from a Canadian province to a US state. The sheer magnitude of the effect attracted further scrutiny. A big piece to resolve the puzzle was contributed by Anderson and van Wincoop (2003). They showed that the omission of what they coined the multilateral resistance term, the barriers to trade affecting all trading partners equally, resulted in a bias of the estimation of the gravity equation. Accounting for these multilateral resistance terms brought down the factor of internal over external trade flows to a factor of about 5. The literature has since further evolved and investigated the issue at different levels of aggregation of the data and for numerous geographical entities.

As is shown in chapter 4, the choice of the distance measure is consequential for estimates of the effect of crossing the origin country's border into another country on their bilateral trade. A number of authors have highlighted this link before. In an endeavour most related to this chapter, Head and Mayer (2009) suggest the harmonic mean as an "effective" measure of distance and are the first to show the potential bias of using other measures on the estimated border effect in simulations. Hillberry and Hummels (2008), using micro-data from the Commodity Flow Survey, show that approximated distances within states and between neighboring states are often far overstated. Using accurate distances at the 5-digit zip code level reveals that the state-level border effect is in fact an artifact of geographic aggregation.

Chapter 4 yields several important results and contributions to the literature: First, I derive a trade cost aggregation that is agnostic to the underlying gravity framework, but yields concrete instructions on the method of computation and data to be used. Importantly, I show that the estimated trade cost coefficient from a gravity equation serves also as a parameter in the respective trade cost aggregation itself; Second, I turn to satellite imagery that provides information on exact location and intensity of economic activity, whether urban or rural region. This eliminates the possibility of measurement error in human-collected population figures and drastically increases the coverage to virtually all inhabited and economically active areas in very fine detail. Furthermore it moves away from a population-weighted measure towards a GDP-based measure, which is more consistent with the theoretical gravity frameworks; And third, the used data has an annual periodicity, allowing me to compute a time series of distances for each country pair and year since 1992.

Contribution and Road Map

This doctoral thesis contributes to the literature in international trade along multiple lines. First, as reflected in the title “Essays on International Trade and Foreign Policy”, I contribute to the literature that seeks to understand the connection between politics and trade. Chapters 1 and 3 feature stylized models that exhibit two mechanisms that so far have not been explicitly formalized in the literature. In the former I delineate the mechanism of why it might be beneficial for bigger countries to economically integrate with smaller countries for geopolitical reasons, defying the customary logic of economic benefits. In the latter, Elsa Leromain and I show how symmetric shocks to political relations can have a heterogeneous impact on trade in imported inputs, as input-output linkages make certain *critical* imported inputs more important for the domestic economy overall.

Second, in chapters 2 and 4 I make two methodological contributions to the gravity model of international trade. In chapter 2, Matthieu Crozet and I show that theory-consistent general equilibrium counterfactuals can be computed exclusively with *observed* trade flows, no extra data is needed. In chapter 4, I derive a theory-consistent trade cost aggregation using a gravity framework that is agnostic to the micro-foundations, while yielding the important result of the respective trade cost elasticity being a parameter in the aggregation itself.

Finally, I introduce multiple new sources of arguable “big” (and “small”) data that have so far not been used in the literature on international trade. In chapter 1, I use data from the GDELT, a dataset comprising more than 300 million political events, that gives the location, participants and tone of the events that took place since 1979. In chapter 4, I use satellite imagery on light emissions, previously used in the growth literature but to my knowledge so far not used in the context of international trade, to proxy economic activity across space. This vast dataset of more than 700 million locations on earth—around 70 million illuminated and on land—and publicly available with an annual periodicity for all years since 1992, allows me to compute time-varying distances that take changes to the economic geography of countries seriously.

The remainder of this doctoral thesis is structured as follows. In chapter 1, I take a closer look at the determinants of economic integration agreements. In chapter 2, Matthieu Crozet and I analyze the impact of the sanctions on Russia on sanctioning countries exports. In chapter 3, Elsa Leromain and I show how certain imported inputs are more sensitive to political relations than others. Finally, in chapter 4 I address the question on how trade costs should be aggregated and compute an improved distance measure using satellite imagery.

1

The Ties that Bind: Geopolitical Motivations for Economic Integration¹

1.1 Introduction

“This connection between economic power and global influence explains why the United States is placing economics at the heart of our own foreign policy. I call it economic statecraft.”

— former Secretary of State Hillary Clinton, Nov. 2012

The geography of economic integration agreements (EIA) is rapidly evolving, especially since the end of the Cold War. Bilateral and multilateral

¹I thank Matthieu Crozet, Lionel Fontagné, Bernard Hoekman, Axel Dreher and Vincent Vicard for valuable comments and suggestions. The chapter greatly benefitted from fruitful discussions with participants of the INFER workshop on “Trade Agreements”, ERF 2014 in Cairo, ETSG 2014 in Munich, GLAD Conference in Göttingen and the Doctorissimes 2013 in Paris. This work was sponsored by the Economic Research Forum (ERF) and has benefited from both financial and intellectual support. The contents and recommendations do not necessarily reflect ERF’s views.

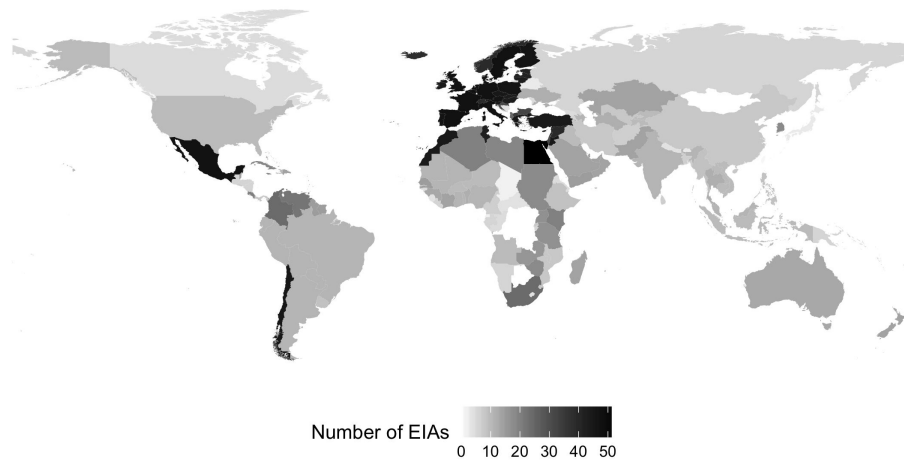


Figure 1.1: Total number of bilateral relations with active EIAs by country in 2006.

EIAs² have seen a massive boost in numbers since the early 1990's, even before the current Doha round of multilateral WTO negotiations came to a seeming halt. While part of the reason for the stark increase in regional and supra-regional trade agreements seems to be grounded in obvious economic benefits, often there appears to be more than “just trade” as incentive: The connection between bilateral political relations and economic integration between partnering countries can be profound, as probably best exemplified by the arguably deepest and most advanced agreement, the European Union. For some country pairs, political motivations may even dominate trade gains altogether, defying the usual logic for how *deep* a trade agreement should be: Why e.g. has the US deeper agreements in the Middle East than with East Asian countries? Figure 1.1 underlines the intuition by showing the number of bilateral relations a country has with an underlying EIA. Aside from the highly integrated European continent, the Middle East in particular appears to be not only a politically volatile region, but also a hotbed of EIAs.

This chapter aims to address the question of how trade policy, in the form of signing a new or deepening of an existing EIA, is influenced by foreign

²Here defined as including any customs union, partial or full free trade agreement.

policy considerations, and more specifically, why countries negotiate and sign agreements with little economic benefits. Aside from traditional trade gains, bilateral trade policy in the form of EIAs appears to follow a pattern in which larger countries form such agreements with smaller, but potentially geopolitically important countries.

This chapter is related to an extensive literature on the determinants and effects of economic integration. Limão (2016) provides a comprehensive overview over the literature on economic and non-economic determinants of preferential trade agreements—as well as their impact on trade. In Limão (2007) he provides the benchmark model on non-traditional determinants of economic integration that incorporates a generic non-trade issue into bilateral trade negotiations and identifies the implications on multilateral trade liberalization. Baier and Bergstrand (2004) and Baier et al. (2014) provide analyses of economic determinants of free trade agreements. In Baier and Bergstrand (2007) they quantify the effect of free trade agreements on trade flows, taking into account potential endogeneity issues of selection into EIAs. Vicard (2009) shows that countries tend to follow different paths of economic integration that he finds, somewhat surprisingly, to exhibit similar trade impacts. Aichele et al. (2014) contribute to the ongoing debate on the economic and political effects of the Transatlantic Trade and Investment Partnership (TTIP) between the European Union and the United States. They estimate the impact of economic integration across the North Atlantic on gross trade, trade in value-added and welfare in a structural gravity framework similar in spirit to Caliendo and Parro (2015). Maggi (2014) and Freund and Ornelas (2010) provide comprehensive overviews of the more recent developments since Baldwin and Venables (1995) and draw the frontiers in this field: According to Freund and Ornelas “participation in any [trade agreement] is a political decision,” warranting future research.

Previous work has established links between EIAs and conflict, capturing one facet of political motivations. Martin et al. (2008b), in their aptly named paper “Make Trade Not War”, show that the onset of war greatly diminishes the value of traded goods, therefore implying that strong trading relations create higher opportunity costs for war, in turn minimizing the probability of conflict. In Martin et al. (2012) they then go on to show that this effect can be institutionalized by forming a trade agreement within a certain time window after a conflict. Vicard (2012) finds that deep economic integration between countries significantly reduces their probability of conflict, while shallow agreements do not. Other papers study the link between trade and politics in a broader sense. Glick and Taylor (2010) estimate the impact of the two world wars on trade and other economic indicators, using a gravity model approach similar to mine. Umana Dajud (2013) studies the impact of political proximity on trade flows, finding that countries ruled by governments that are similar in terms of their position on the left/right spectrum and degree of authoritarianism/libertarianism, have a greater exchange of goods. Lederman and Ozden (2007) show how US geopolitical interests, as expressed through political alliances, are played out against preferential access to the US market. Berger et al. (2013) reveal another aspect of the mixing of political and commercial interests by showing how CIA interventions lead to an increase in US imports by the affected country.

Naturally, the interaction between trade policy and foreign policy has also been studied from the perspective of political science. Waltz (1999) and Nye (1988, 2011) portray the thinking in the two most prominent schools of thought in this respect: the school of realism and that of (neo)liberalism. Others have established the link between domestic politics and trade agreements: Mansfield et al. (2002) show that trade agreements generate information that help leaders “show their constituents their achievements” during their time in power. Liu and Ornelas (2014) find further evidence for this hypothesis, showing that trade agreements can serve as a commitment device for the purpose of stabilizing a democratic regime (Maggi,

2014). This resonates also with results from Mansfield et al. (2000), who demonstrate common characteristics of signatories of trade agreements: Democracies set trade barriers reciprocally at lower levels than autocracies.

This chapter contributes to the literature by seeking to demonstrate the impact of political motivations for EIAs. Building on a modified version of the model introduced by Limão (2007), I show how in a stylized framework a big country may weigh alternative motivations for integration—of economic or political nature—while a smaller country may be indifferent between possible partner countries at the same time. I test these predictions with proxies for economic and political motivations for integration. The economic motivation is proxied by *non-realized* trade gains computed using general equilibrium counterfactuals from a gravity framework. In the gravity setup I introduce an index of depth of integration that improves upon the customary estimation with a dummy variable, allowing for heterogeneity of effects. The political motivation is proxied by two new indices to describe the state of political relations between two countries—bilateral political *importance* and *mood*—harnessing the powers of the GDELT dataset on political events.

The chapter is structured as follows. In section 1.2 I sketch a model that displays the mechanism through which countries choose their contracting partner for an EIA—allowing for economic and political motivations. In section 1.3 I introduce an index of depth of economic integration, estimate the elasticity of trade to this depth and subsequently calculate the trade gains of existing and hypothetical EIAs between countries. In section 1.4 I construct two new indices that quantify bilateral political relations: the bilateral mood and importance. Finally in section 1.5 I bring both empirical components together and estimate the effect of political motivations as a determinant of trade policy. Section 1.6 concludes.

1.2 Theoretical model

The stylized model broadly follows Limão (2007). Aside from the initial setup and notation, it is particularly similar in the way the non-trade motivation for economic integration is modeled: A *small* country produces a public good with a positive externality for a *big* country, which yields the latter to grant preferential access to its market to the former. The present model diverges from Limão (2007) in two important aspects, however. It is a one shot game that ignores enforcement constraints and its purpose is to demonstrate different outcomes contingent on initial parameters through comparative statics. The game takes place in a situation in which each country is potentially signing an economic integration with one other country, weighing the alternatives. Furthermore, in the present model there exists no multilateral trade policy and the basic setting consists of three countries j : Two big countries, defined by their larger endowment with non-public goods—one with an economically-focused population E and one with a politically-aware population P —as well as a small country S , all of which can potentially enter economic integration agreements with each other. Next to a public good G there exist different kinds of private goods in the global economy: a non-traded good n and three traded goods i denoted with lowercase e , p , and s .

For simplicity, each of the countries has a population of the size L and the two big countries are symmetric in economic size.³ Each individual in the two big countries is endowed with one unit of *each* traded good $i \in \{e, p\}$, while in the small country each individual is endowed with only one traded good $i \in \{s\}$. The non-traded good is produced with labor and constant returns, with the marginal product normalized to 1.

³This assumption is not necessary for the results below. As long as E is sufficiently larger than S (in the sense that it retains most bargaining power), while being sufficiently similar in size compared to P (in the sense of having similar bargaining power in negotiations) the derived predictions remain the same.

1.2.1 The Consumer

Each consumer in $j \in \{E, P, S\}$ has preferences over the consumption of the non-traded good c_n^j , the traded goods c_i^j and a public good G . Each individual's utility is written as

$$U^j = c_n^j + \sum_i u_i^j(c_i^j) + \bar{\Psi}^j(G^j, G^{\setminus j})$$

whereas the subutility function for the public good is

$$\bar{\Psi}^j(G^j, G^{\setminus j}) = \lambda^j \Psi(G^j) + \alpha^j \lambda^j \Psi(G^{\setminus j}) \quad \text{with } \lambda^j, \alpha^j \geq 0.$$

λ^j is the weight placed on the public good G and global spillovers occur if α^j is non-zero, both of which are country specific. A high α^j signals a high sensitivity towards the public good produced abroad. Ψ and u are assumed to meet the Inada conditions. G can be interpreted as public expenditures to address issues with global spillovers, such as the fight against terrorism, for security against piracy, but also, like in Limão (2007) for environmental or labor standards.

The individual's income y consists of a wage w , net taxes equal to a per capita lump-sum transfer of the government's tariff revenue r minus a tax used to finance public good g , and her value of endowments with goods $i \in \{e, p, s\}$, so that

$$y^j = w^j + (r^j - g^j) + \sum_i p_i^j$$

For given prices, taxes, income and level of G , the individual chooses the quantities of the private goods $i \in \{e, p, s\}$ she consumes to maximize her utility subject to the budget constraint

$$c_n^j + \sum_i p_i^j c_i^j \leq y^j$$

Given the assumptions on the utility, the budget constraint is satisfied with

equality, thus individual demand is

$$d_i^j(p_i^j) = [w_i^j(p_i^j)]^{-1}$$

for each of the traded goods. The individual's indirect utility is then

$$W^j/L = y^j + \bar{\Psi}^j(G^j, G^{\setminus j}) + \sum_i v_i^j(p_i^j)$$

where the last term represents consumer surplus.

As in Limão (2007), I am interested in the case in which there is an underprovision of the public good G in the small country from the point of view of the politically-aware country. I follow Limão's assumptions on consumers in the small country and take the extreme case where the population in S places no weight ($\lambda^S = 0$) on the provision of the public good and receives no utility from traded goods. As Limão (2007) shows, this "trick" circumvents any possible trade diversion effects and puts the focus on the non-economic motivation. Consumers in S only value the non-traded good. The indirect utility for individuals in the small country is therefore equal to income y . Furthermore, I assume that while consumers in E and P place the same weight on the provision of the domestic public good so that $\lambda^E = \lambda^P$, while consumers in E do not care about the provision of the public good in other countries, so that $\alpha^E = 0$.⁴ Hence, the indirect utility for individuals in E is equal to the value of the traded and non-traded goods, and the provision of G by the domestic government. This is the distinctive difference between the two big countries, which are otherwise indistinguishable.

⁴This is obviously an extreme case, but it nicely demonstrates the underlying mechanism. The results hold for any $\alpha^E < \alpha^P$.

1.2.2 The Government

The government sets the trade policy and chooses G to maximize domestic aggregate welfare. The public good is produced using l_g^j units of labor in a linear production function

$$G^j = b^j l_g^j$$

The population L is assumed to be sufficiently large so that the non-traded good is always produced in equilibrium, fixing the wage at unity. Then the cost of producing a given level G^j is simply l_g^j . The tariff revenue is distributed to consumers as a lump-sum transfer and hence government revenue comes exclusively from taxes g^j , so that the government budget constraint is

$$G^j = b^j L g^j$$

The government therefore chooses g^j to fund the production of G^j . The government also decides on the tariffs on imported traded goods, τ_i^j .⁵

1.2.3 Trade Pattern and Objective Functions

As the two big countries E and P have the same endowments of each traded good, differences in the u_i^j and therefore in the respective demand determine the trade pattern of $i \in \{e, p\}$. The small country derives no utility from these goods and therefore exports its endowment of good $i \in \{s\}$ in its entirety, without importing any of the other two goods. This implies that the small country does not set *any* tariff, so that in case of economic integration it cannot offer any reduction of tariffs.⁶ Hence, all

⁵Under the above assumptions these are specific to the trade partner, as S is only endowed with $i \in \{s\}$, so that each country imports a respective good from only one partner country.

⁶As motivated by Limão (2007), small countries' tariffs usually are not a central component of EIA's with big countries. Following Ethier (1998), trade liberalization by smaller countries usually takes the form of unilateral trade liberalization.

the small country can offer to a big country is the provision of the public good. In return, lower tariffs from a big country increase the price that the small country receives for its exports of $i \in \{s\}$.

Prices p_i^j are therefore determined through net imports M_i^j summing to zero, so that

$$\begin{aligned} M_e^E(p_e^E) + M_e^P(p_e^E - \tau_e^E) &= M_e^E(p_e^P - \tau_e^P) + M_e^P(p_e^P) = 0 \\ M_p^E(p_p^E) + M_p^P(p_p^E - \tau_p^E) &= M_p^E(p_p^P - \tau_p^P) + M_p^P(p_p^P) = 0 \\ M_s^E(p_s^E - \tau_s^E) + M_s^P(p_s^P - \tau_s^P) + M_s^S &= 0 \end{aligned}$$

Net imports are given by $M_i^j = (d_i^j(p_i^j) - 1)L$ for $j \in \{E, P\}$ and $M_s^S = -L$. The objective functions in terms of the policy variables for the three governments are then

$$W^S(g^S, \tau_s^E, \tau_s^P) = L \left(w - g^S + \gamma(p_s^E(\tau_s^E) - \tau_s^E) + (1 - \gamma)(p_s^P(\tau_s^P) - \tau_s^P) \right) \quad (1.1)$$

for the small country, while for the economically-minded being

$$\begin{aligned} W^E(g^E, \tau_e^j, \tau_p^j, \tau_s^E) &= \\ &L \left(w - g^E + \lambda^E \Psi(b^E L g^E) \right) \\ &- \left(M_s^E \tau_s^E + \max(M_e^E(\tau_e^E, \tau_e^P), 0) \tau_e^E + \max(M_p^E(\tau_p^E, \tau_p^P), 0) \tau_p^E \right) \\ &+ L \eta_s^E + L \eta_e^E + L \eta_p^E \end{aligned} \quad (1.2)$$

and finally for the politically-aware country

$$\begin{aligned} W^P(g^P, g^E, g^S, \tau_e^j, \tau_p^j, \tau_s^P) &= \\ &L \left(w - g^P + \lambda^P \Psi(b^P L g^P) + \alpha^P \lambda^P \Psi(b^E L g^E) + \alpha^P \lambda^P \Psi(b^S L g^S) \right) \\ &- \left(M_s^P \tau_s^P + \max(M_e^P(\tau_e^E, \tau_e^P), 0) \tau_e^P + \max(M_p^P(\tau_p^E, \tau_p^P), 0) \tau_p^P \right) \\ &+ L \eta_s^P + L \eta_e^P + L \eta_p^P \end{aligned} \quad (1.3)$$

γ is the share of exports from S to E (and hence $1 - \gamma$ the share to P) and $\eta_i^j = p_i^j(\tau_i^j) + v_i^j(p_i^j(\tau_i^j))$ the consumer surplus from good i in country j . Similar to Limão (2007), for the small country the objective function, equation (1.1), consists of aggregate wages Lw , the production cost for the provision of the public good Lg^S as well as the export revenue by destination E and P . For the economically-focused country the objective function, equation (1.2), consists of aggregate wages, productions costs for the public good, and the utility from the domestic public good $\lambda^E \Psi(b^E Lg^E)$, as well as tariff revenue on positive net imports (second row) and the aggregate surplus from goods $i \in \{e, p, s\}$ (third row). The objective function in the politically-aware country, equation (1.3), is analogous to the one in the economically-focused one, with the addition of the terms $\alpha^P \lambda^P \Psi(b^j Lg^j) \forall j \in \{E, S\}$, that represent the sensitivity to public goods produced abroad.

1.2.4 Comparative Statics: Integrating for Economic or Political Reasons

The situation is the following. Each country can enter an EIA with one of the other countries. Hence there are three possible scenarios of integration: P with E , P with S and E with S . Assume that the differences in demand are sufficiently large such that lower trade barriers are always Pareto improving. Given the asymmetries of the countries and following Limão (2007), the two big countries possess all the bargaining power in negotiations with the small country, while they have equal bargaining power in bilateral negotiations.

The non-cooperative Nash outcome is given by a solution $\{\tau_i^j, g^S\}$, i.e. all import tariffs by good and country and the level of provision of the public good in S .⁷ The solution is found by maximizing equations (1.1), (1.2)

⁷As consumers in both big countries value the domestic production of the public good it is always provided in these countries.

and (1.3) taking the other countries' policies as given. Analogous to the maximization problem in Limão (2007) this yields

$$\bar{\tau}_{i \in \{e,p\}}^j = \arg \max \{W^j\}; \quad \bar{\tau}_s^E = \bar{\tau}_s^P = p_s^E = p_s^P; \quad g^S = 0. \quad (1.4)$$

The respective $\bar{\tau}_i^j$ depend on the utility functions w_i^j and represent the upper bound tariff. The import tariffs on good s are both equal to the price of s in both countries: As S does not value the good, both big countries increase their tariff until it equals the price, thereby fully extracting and sharing the surplus. At the same time, S does not value the public good and hence provides none of it.

In this situation, multiple scenarios would yield welfare improvements for at least one of the countries. E would benefit from lower tariffs in P , i.e. for $\tau_i^{P'} < \bar{\tau}_i^P$; P would benefit from lower tariffs in E , i.e. for $\tau_i^{E'} < \bar{\tau}_i^E$; S would benefit from lower tariffs in P and E , i.e. for $\tau_s^{j'} < \bar{\tau}_s^j$ and P would benefit from higher production of the public good in S , i.e. $g^{S'} > g^S = 0$.

Setting enforcement issues aside, all three countries now consider which other country to integrate with. An agreement only comes to fruition when *both* parties agree. I first focus on the alternatives for the small country, which is considering potential benefits from an agreement with either P or E . As both big countries have all bargaining power, they both offer a “take it or leave it” contract to the small country. P provides an offer that is similar to the solution described by Limão (2007) in detail:

$$\begin{aligned} \{\tau_s^{P'}(\bar{\tau}_s^P), g^{S'}(\bar{\tau}_s^P)\} = \\ \arg \max_{\tau_s^P, g^S} \{W^P(\tau_e^j, \tau_s^P, \cdot) : W^S(g^S, \tau_s^P, \cdot) \geq W^S(g^S = 0, \tau_s^P = \bar{\tau}_s^P, \cdot)\} \end{aligned} \quad (1.5)$$

P benefits from an increase in g^S up until the constraint binds, which is at the point where S is indifferent to the previous situation of $\bar{\tau}_s^P$ and $g^S = 0$.

By way of equation (1.1) the solution is therefore at $g^{S'}(\bar{\tau}_s^P) = (\bar{\tau}_s^P - \tau_s^P)/L$, where the per capita revenue of S 's exports to P is equal to the tax required to fund the provision of g^S . On the other hand, E has no improvement in welfare by integrating with S and hence offers the exact same package as before, such that $\tau_s^{E'} = \bar{\tau}_s^E$. From the point of view of a consumer in S , however, the welfare implications of the two alternatives are exactly the same, as both offer no welfare improvement. Hence the government of S is indifferent between both potential partners.

Looking at the economically-focused country E , the alternatives are quite clear. As described above, an integration with S offers no welfare improvement to E , as S does not import anything from E and E only values the domestically produced public good g^E . On the other hand, integrating with P through reciprocally lower bilateral import tariffs yields improvements in welfare for E . Tariffs in this situation are defined by

$$\begin{aligned} \{\tau_e^{P'}(\bar{\tau}_e^P), \tau_s^{P'}(\bar{\tau}_s^P)\} = \\ \arg \max_{\tau_i^P, \tau_i^E} \{W^E(\tau_i^E, \tau_i^P, \cdot) : W^P(\tau_i^E, \tau_i^P, \cdot) \geq W^P(\tau_i^E = \bar{\tau}_i^E, \tau_i^P = \bar{\tau}_i^P, \cdot)\} \end{aligned} \quad (1.6)$$

Hence the government of E will only form an agreement with P , as it is the only option that is welfare improving under the assumptions given.

Finally coming to the alternatives for integration for the politically-aware country P . As described above, P can improve its welfare by either integrating with E and reaping further utility through the consumption of imported traded goods, i.e. an *economic* motivation. Alternatively, P can integrate with S and improve its aggregate welfare by deriving utility from the provision of g^S , produced by the smaller country although S itself does not gain any utility from it. Which of the two options prevails is determined by the respective terms in the objective function of P , equation

(1.3):

$$\alpha^P \lambda^P \Psi(b^S L g^S) + \eta_s^P + M_s^P \tau_s^P \leqslant - \left(\max(M_e^P(\tau_e^E, \tau_e^P), 0) \tau_e^P + \max(M_p^P(\tau_p^E, \tau_p^P), 0) \tau_p^P \right) / L + \eta_e^P + \eta_p^P \quad (1.7)$$

If the left-hand side, driven by a large parameter α^P , is greater than the right-hand side, the additional welfare of signing an agreement with S is greater than integrating with E , and vice versa. To put it in other words, a sufficiently large α^P , the sensitivity to the public good produced abroad, can lead to a larger change in welfare from economically integrating with the small country than the change in welfare from reciprocally lower trade barriers by integrating with E .

1.2.5 Reduced Form Predictions of the Model

The predictions of this stylized model are therefore twofold: First, a “big” country that values the provision of a public good in a partner country—what in this case I call a “geopolitical motivation”—weighs economic against non-economic benefits in the choice of the contracting partner country. Either motivation is a necessary, but neither is a sufficient condition for integration. Second, a “small” country, due to its limited bargaining power, is indifferent between integrating with a selection of comparably big countries. This does not mean the small country is passive in the negotiations, it is merely indifferent between alternatives. I test these predictions in section 1.5, using proxies for economic and political motivations that I describe in more detail in the following.

1.3 Depth and Trade Gains of Economic Integration

In order to analyze the effect of political motivations for economic integration, I first estimate the trade gains brought about by the agreement, which are unquestionably a primary determinant. More specifically, I compute *non-realized* trade gains as a proxy for the economic motivation to integrate with a partner country. I do this with the help of a structural gravity framework.

The existence of a trade agreement, whether in a form of a full-fledged FTA or a mere bilateral agreement on minor tariff reductions, has traditionally appeared as a dummy variable in most gravity equations. However, this might leave out important information about the depth of an agreement and therefore the effect on trade flows between two countries. I account for this heterogeneity by constructing an index of depth for 306 unique agreements.⁸

1.3.1 Depth of Economic Integration Agreements

The main characteristics of the design of an EIA are its depth, scope and flexibility (Baccini and Dür, 2011). Deep EIAs, as understood in the economic literature, exhibit far-reaching regulatory provisions that go beyond a mere decrease or abolition of tariffs. The inclusion of further provisions, e.g. on government procurement, services and intellectual property describe a wider scope. Flexibility describes the mechanisms and circumstances under which countries may break these provisions without voiding the entire agreement.

⁸With an additional 44 accessions to existing agreements.

Breaking down these features of EIAs into one index is obviously a difficult task. The multidimensionality of the information on each agreement will be lost to a certain degree. Kohl et al. (2013) propose an aggregate “index of trade agreement heterogeneity” by counting the number of areas covered by the agreement and dividing by all areas that are available in the data. In order to account for the distinction between depth and scope, I refine this index by weighting by legal enforceability of the provisions. Horn et al. (2010) and Orefice and Rocha (2011), upon whose data the index is primarily built, code agreements by area with 2 for legally enforceable provision, 1 for non-enforceable provision and 0 for no provision at all.⁹ I follow this notion and give legally enforceable provisions twice the weight as non-enforceable ones, implicitly forming the assumption that legal enforceability is increasing the depth of an EIA.¹⁰ The index of depth of integration then reads

$$d_{odt} = \frac{\sum_p I_{p,odt}}{2 \cdot \text{number of areas}}$$

where $I_{p,odt}$ is an indicator for whether a provision p is in force between two countries o and d at time t .¹¹ The indicator variable is set to 1 if the agreement includes provisions in the respective area, to 2 if these provisions are also legally enforceable, and to 0 otherwise.

EIAs can be bilateral or multilateral and additionally often allow for accessions of further countries. I treat agreements between multiple countries as a “web of bilateral” treaties. Agreements between the EU and a third country are therefore treated exactly the same as individual agreements of all EU member states with this third country. Accessions are also treated

⁹See appendix table A.1 for a description of the areas of provision as defined in Horn et al. (2010).

¹⁰Although the choice of the weight for legal enforceability is of course somewhat arbitrary, the econometric results of the estimation of the gravity equation do not vary significantly with different weighting.

¹¹Note that deviating from the model in section 1.2, in the following the origin country of a trade flow or bilateral agreement is denoted o , while the destination country is d .

as bilateral treaties, however only between existing countries and the newly acceding country. Additionally, new member states “inherit” old agreements between the trading bloc and non-member trade agreement partners.¹² As some country pairs have signed more than one agreement over time which all remain in effect while covering different issues, the overall depth of integration between countries is therefore at least as big as any one depth of the separate agreements. The index is based on an updated and extended version of the accompanying database included in the World Trade Report 2011¹³ and the dataset provided alongside Kohl et al. (2013). I further extend the data to account for entries to and exits from agreements allowing the introduction of a proper time dimension.¹⁴ The index is constructed for all years between 1950 and 2010.

According to the index, the three deepest agreements are the European Union (1), NAFTA (0.77) and the EU-Turkey customs union and association agreement (0.76). Figure 1.2a shows the distribution of depths of EIAs in 2000, capturing a total of 5236 unique bilateral relations with EIA, out of approximately 40.000 bilateral country pair relations. The mean depth is 0.534. Figure 1.2b shows the evolution of depth between Germany and France from 1950 to 2006. After the initial step of economic integration through the European Coal and Steel Community, successive waves of integration are reflected in the increase of the index of depth of integration. This variation from the time dimension will be used below to estimate the elasticity of trade to the depth of integration between two countries.

¹²An example illustrates the differences: The initial EU treaty, the treaty of Rome (1958), is considered as a multitude of agreements between Belgium, France, (West) Germany, Italy, Luxembourg, and the Netherlands. The enlargement of 1973 with the accession of the UK and Denmark is considered as bilateral treaties between each of the then EU-members and each of the new member states. A FTA between the EU and Switzerland also went in effect on 01/01/1973, and this treaty was immediately “inherited” by the UK and Denmark, and is considered as bilateral agreements between them, although they never took part in the negotiations beforehand.

¹³Originally Horn et al. (2010) and updated by Orefice and Rocha (2011).

¹⁴See the appendix for further information. The full dataset is available on http://julianhinz.com/research/eia_dataset/.

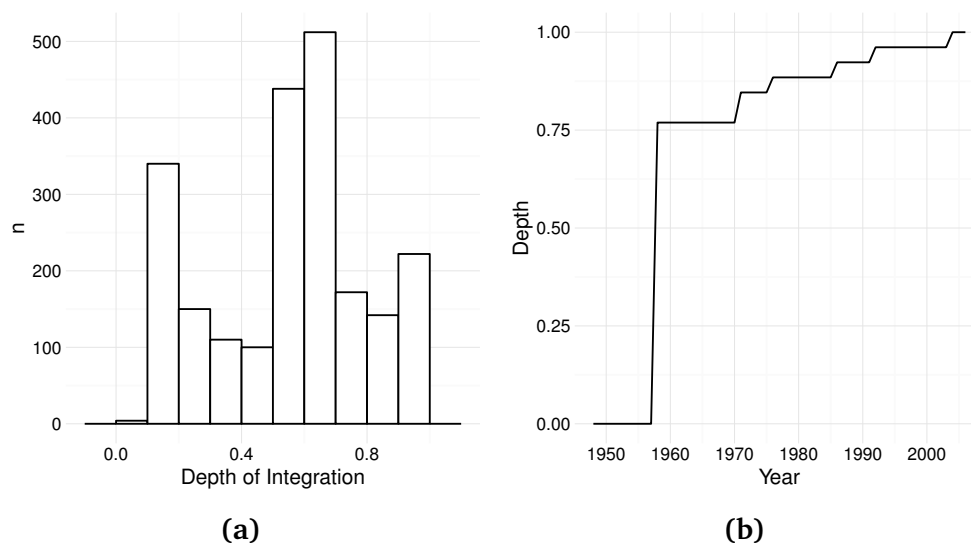


Figure 1.2: Histogram of depths of EIAs in 2006 (a) and variation of depth between Germany and France over time (b).

1.3.2 Estimating Trade Gains with Gravity

In order to calculate the trade gains of an EIA, I estimate the elasticity of trade to the depth of integration between origin and destination country in a modified structural gravity equation framework, similar in spirit to the one introduced in chapter 2, which extends the previous works by Dekle et al. (2007, 2008) and Anderson et al. (2015). The framework allows for a straightforward estimation of trade flows in the presence (and absence) of trade barriers. The calculated index of depth of integration is used to estimate the elasticity of trade flows to this depth. Using the estimated elasticity then allows me to compute counterfactual general equilibrium trade flows between all countries and by extension the gains from trade with respect to any particular depth of any hypothetical agreement.

Exports from an origin country o to a destination country d at time t are assumed to follow a standard gravity equation à la Anderson (1979):

$$x_{odt} = \frac{Y_{ot}}{\Pi_{ot}^{1-\sigma}} \frac{E_{dt}}{P_{dt}^{1-\sigma}} \tau_{odt}^{1-\sigma} \quad (1.8)$$

The trade flow x_{odt} is determined by the exporter-specific production Y_{ot} and outward multilateral resistance term Π_{ot} , the importer-specific expenditure E_{dt} and inward multilateral resistance term P_{dt} , i.e. the CES price index of the demand system, and time-varying trade costs τ_{odt} between both countries. σ is the elasticity of substitution across varieties of the same good differentiated by place of origin. Trade costs are assumed to be dependent on the depth of an existing EIA and other determinants

$$\tau_{odt} = \exp(\rho \mathbf{d}_{odt}) \nu_{odt} \quad (1.9)$$

ρ is the elasticity of trade costs to the depth of integration between countries o and d . The elasticity is assumed to be constant across country pairs and over time, which allows me to exploit the depth's variation over time and country pairs to obtain an estimate for the parameter.¹⁵ \mathbf{d}_{odt} is the depth of integration between countries o and d at time t , and ν_{odt} a vector of additional standard trade barriers, such as distance, common language, etc. The multilateral resistance terms are given by

$$P_{dt} = \left[\sum_o \frac{Y_{ot}}{\Pi_{ot}^{1-\sigma}} \tau_{odt}^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (1.10)$$

$$\Pi_{ot} = \left[\sum_d \frac{E_{dt}}{P_{dt}^{1-\sigma}} \tau_{dot}^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \quad (1.11)$$

Furthermore, following Anderson et al. (2015), from the market clearing condition $Y_{ot} = \sum_d x_{odt}$ follows that

$$\begin{aligned} Y_{ot} &= \sum_d x_{odt} = \sum_d \frac{E_{dt}}{P_{dt}^{1-\sigma}} (\gamma_{ot} p_{ot} \tau_{odt})^{1-\sigma} \\ &= (\gamma_{ot} p_{ot})^{1-\sigma} \sum_d \frac{E_{dt}}{P_{dt}^{1-\sigma}} \tau_{odt}^{1-\sigma} \quad \forall \quad dt \\ \Leftrightarrow p_{ot} &= \frac{Y_{ot}^{\frac{1}{1-\sigma}}}{\gamma_{ot} \Pi_{ot}} \end{aligned} \quad (1.12)$$

where p_{ot} is country o 's supply price and γ_{ot} a positive distribution parameter of the CES utility function (Anderson et al., 2015). The implications

¹⁵The elasticity of trade to the depth of integration is therefore $\rho(1 - \sigma)$.

are relevant for production and expenditure figures in the face of changes to bilateral trade costs through the term in the denominator.

Combining equations (1.8), (1.9), (1.10), (1.11) and (1.12), exports from country o to country d can be expressed as a function of \mathbf{d}_{odt} :

$$x_{odt}(\mathbf{d}_{odt}) = \frac{Y_{ot}(\mathbf{d}_{odt})}{\Pi_{ot}(\mathbf{d}_{odt})^{1-\sigma}} \frac{E_{dt}(\mathbf{d}_{odt})}{P_{dt}(\mathbf{d}_{odt})^{1-\sigma}} \tau_{odt}(\mathbf{d}_{odt})^{1-\sigma}.$$

A change in the depth of integration between o and d from \mathbf{d}_{odt} to \mathbf{d}'_{odt} affects *all* components of the gravity setup: The partial equilibrium effect is reflected in the changes occurring in the trade costs $\tau_{odt}(\mathbf{d}'_{odt})^{1-\sigma}$. However, this disregards feedback effects from changes to inward and outward multilateral resistance terms as well as production and expenditure figures. Taking also into account the effect on multilateral resistance, i.e. $\Pi_{ot}(\mathbf{d}'_{odt})^{1-\sigma}$ and $P_{dt}(\mathbf{d}'_{odt})^{1-\sigma}$, constitutes what Head and Mayer (2014) coin the modular trade impact. However, production and expenditure terms are also impacted, as reflected by $Y_{ot}(\mathbf{d}'_{odt})$ and $E_{dt}(\mathbf{d}'_{odt})$. Adjusting for these changes as well then can be called the general equilibrium impact.

In the current context I call the *trade gains* of signing or deepening an existing agreement the percentage change in total exports of a country o :

$$\text{Trade gains}_{odt}(\mathbf{d}_{odt}, \mathbf{d}'_{odt}) = \frac{\sum_{k \neq j} x_{ikt}(\mathbf{d}'_{odt}) + x_{odt}(\mathbf{d}'_{odt})}{\sum_{k \neq j} x_{ikt}(\mathbf{d}_{odt}) + x_{odt}(\mathbf{d}_{odt})} - 1 \quad (1.13)$$

Note that this percentage change of total exports of a hypothetical change in depth from \mathbf{d}_{odt} to \mathbf{d}'_{odt} takes into account *all* bilateral trade flows in the trade matrix, so as to account for the general equilibrium effects described above.¹⁶

Equation (1.13) can be used to compute the *non-realized* trade gains for a country pair, i.e. the foregone increase in exports by not having signed a

¹⁶An alternative measure would be a change in welfare à la Arkolakis et al. (2012).

full-depth agreement yet. In line with the model in section 1.2 where increased exports through lower trade costs improve welfare through higher income, I will later use these non-realized trade gains to characterize the economic motivation for integration. Were only this economic motivation to matter, as represented by country E in the model, EIAs would be formed in the sense of “picking the low-hanging fruit”. This would entail a world in which all α^j are set to zero: Integration would only follow trade objectives. A country would simply pick its partner by the highest possible trade gains.

Returning to the gravity framework, I now estimate $\rho(1 - \sigma)$, the elasticity of trade flows to the depth d , by regressing equation (1.8), making use of the variation over time of depth and trade flows in a panel. To account for zero trade flows in the data, I estimate the equation using an Eaton-Kortum-type Tobit approach in which the minimum reported importer value is chosen as threshold.¹⁷ I include origin \times year, destination \times year, and country-pair fixed effects to capture unobserved factors following Baier and Bergstrand (2007), accounting for possible omitted variables and simultaneity biases.

Log-linearizing equation (1.8) yields

$$\log x_{odt} = \log \left(\frac{Y_{ot}}{\Pi_{ot}^{1-\sigma}} \right) + \log \left(\frac{E_{dt}}{P_{dt}^{1-\sigma}} \right) + \log \nu_{odt} + (1 - \sigma) \rho \mathbf{d}_{odt}$$

which can then be estimated using fixed effects as

$$\log X_{odt} = \Xi_{ot} + \Theta_{dt} + \phi_{od} + \delta_0 \mathbf{u}_{odt} + \delta_1 \mathbf{d}_{odt} + \epsilon_{odt} \quad (1.14)$$

X_{odt} are the exports from country o to country d in year t . Ξ_{ot} is the origin \times year fixed effect, Θ_{dt} is the destination \times year fixed effect. \mathbf{u}_{odt} are a number of time-varying standard gravity controls, in this case the

¹⁷See Head and Mayer (2014) for an overview over state-of-the-art gravity estimation techniques and Eaton and Kortum (2002) for the original Tobit approach.

	Dependent variable:			
	log(Exports _{odt})		Exports _{odt}	
	(1)	(2)	(3)	(4)
Depth index	0.488*** (0.018)		0.897*** (0.028)	
RTA Dummy		0.322*** (0.013)		0.473*** (0.020)
Estimator	OLS	OLS	Tobit	Tobit
Observations	678,430	678,430	1,084,989	1,084,989
R ²	0.856	0.856		
Adjusted R ²	0.845	0.845		

Notes: All regression include origin \times year, destination \times year and origin \times destination fixed effects. Coefficients for control variables are suppressed. Robust standard errors in parentheses are clustered by exporter \times importer. Significance levels: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 1.1: Gravity Regression

incidence of conflict, a hegemony-colony relationship and common membership in a monetary union, all of which are sourced from the CEPII gravity dataset (Head et al., 2010). The included country-pair fixed effect ϕ_{od} absorbs all time-invariant gravity controls. d_{odt} is the index of depth of integration between the two countries o and d at time t , as calculated above. The aggregate trade data is taken from UN Comtrade for the years 1960–2006. Descriptive statistics for trade in the year 2000 with summary statistics on EIAs and depth by country are displayed in table A.2 in appendix A.3.

Table 1.1 reports the estimated coefficients for an OLS estimator (without zero flows) in columns (1) and (2) and for the preferred estimation with the Eaton-Kortum-type Tobit estimation in columns (3) and (4). The regression yields a $\hat{\delta}_1 = 0.897$, implying an increase in bilateral trade between origin and destination country of about $\exp(0.897) - 1 = 145\%$ for a full-depth EIA. This number appears sensible, as usual estimations with a dummy variable for an existing EIA yield results between 40–70 %, ¹⁸

¹⁸Compare e.g. Martin et al. (2012) ($\delta_1 = 0.311$) or Baier and Bergstrand (2007)

where the dummy amounts to “averaging” the depth of all EIAs. In fact, estimating the same regression with the dummy variable for an existing EIA from Martin et al. (2012) (columns 2 and 4) yields a $\hat{\delta}_1 = 0.473$, which translates into an increase in exports of about 60 %. The results stand in some way in contrast to Vicard (2009) who finds similar average partial trade effect for various depths of integration. The difference, however, is likely a result of alternative measures of depth, as Kohl and Trojanowska (2015) do indeed find a heterogeneous impact of depth of integration using dummy variables in a structural gravity setup for each of the above described areas of provisions.

Using the estimated fixed effects and coefficients from the estimation I construct general equilibrium counterfactuals in a similar procedure as introduced in chapter 2. These counterfactual trade flows for any setting of \mathbf{d}'_{odt} can be computed as

$$\hat{X}_{odt} = \frac{\hat{Y}_{ot}(\mathbf{d}'_{odt})}{\hat{\Pi}_{ot}(\mathbf{d}'_{odt})^{1-\sigma}} \frac{\hat{E}_{dt}(\mathbf{d}'_{odt})}{\hat{P}_{dt}(\mathbf{d}'_{odt})^{1-\sigma}} \hat{\tau}_{odt}(\mathbf{d}'_{odt})^{1-\sigma} \quad (1.15)$$

where *all* terms reflect the hypothetical changes to the depth of integration between countries o and d .¹⁹ Armed with counterfactual flows for all possible combinations of countries and respective changes to their depths of integration, the computation of equation (1.13) then delivers estimates for non-realized trade gains by setting $\mathbf{d}'_{odt} = 1$, such that

$$\text{Trade gains}_{odt}^{NR} = \text{Trade gains}_{odt}(\mathbf{d}_{odt}, 1) = \frac{\sum_{k \neq d} \hat{X}_{okt}(1) + \hat{X}_{odt}(1)}{\sum_k X_{okt}} - 1$$

These non-realized trade gains are used in section 1.5 to proxy economic motivations to form or deepen an EIA with a partner country.

($\delta_1 = 0.68$).

¹⁹See appendix A.2 for details on the procedure.

(a) Realized trade gains in percent

	Destination	realized	full-depth	non-realized	depth index
1	Canada	5.279	5.761	0.482	0.923
2	Mexico	3.095	3.382	0.287	0.923
3	Singapore	0.772	1.161	0.389	0.731
4	Australia	0.541	0.638	0.097	0.885
5	Israel	0.265	0.473	0.208	0.615
6	Chile	0.186	0.218	0.032	0.885
7	Viet Nam	0.027	0.073	0.046	0.462
8	Morocco	0.026	0.032	0.007	0.846
9	Jordan	0.014	0.047	0.032	0.385
10	Bahrain	0.014	0.023	0.009	0.692

(b) Full-depth trade gains in percent

	Destination	realized	full-depth	non-realized	depth index
1	Japan	0.000	6.795	6.795	0.000
2	China	0.000	6.548	6.548	0.000
3	Canada	5.279	5.761	0.482	0.923
4	Germany	0.000	5.219	5.219	0.000
5	United Kingdom	0.000	4.816	4.816	0.000
6	Netherlands	0.000	3.497	3.497	0.000
7	South Korea	0.000	3.464	3.464	0.000
8	Mexico	3.095	3.382	0.287	0.923
9	France	0.000	2.884	2.884	0.000
10	Belgium	0.000	2.361	2.361	0.000

(c) Non-realized trade gains in percent

	Destination	realized	full-depth	non-realized	depth index
1	Japan	0.000	6.795	6.795	0.000
2	China	0.000	6.548	6.548	0.000
3	Germany	0.000	5.219	5.219	0.000
4	United Kingdom	0.000	4.816	4.816	0.000
5	Netherlands	0.000	3.497	3.497	0.000
6	South Korea	0.000	3.464	3.464	0.000
7	France	0.000	2.884	2.884	0.000
8	Belgium	0.000	2.361	2.361	0.000
9	Taiwan	0.000	2.197	2.197	0.000
10	Hong Kong	0.000	2.172	2.172	0.000

Table 1.2: Top 10 trade gains for USA in 2006 by type

Tables 1.2a, 1.2b and 1.2c display the top 10 of bilateral trade relations for the United States in 2006 in terms of currently realized trade gains, hypothetical trade gains for a full-depth integration and non-realized trade gains. The ranking and magnitude of realized, full-depth and non-realized trade gains is very sensible. At the same time, the rankings display the

curious choices of US trade policy. Canada and Mexico rank high in both rankings of realized and full-depth trade gains (ranked 1st and 2nd in table 1.2a and ranked 3rd and 6th in table 1.2b) and can be considered *natural* partners for EIAs, absent of other motivations. Other top rankings of realized trade gains are more unusual: Singapore, Australia and Israel are comparatively small economies and far away. Neither of them shows up in the top 10 of full-depth trade gains (Singapore is ranked 18th, Australia 27th and Israel 32nd). In fact, in 2006 the United States had EIAs with only two countries ranked in the top 10 of full-depth trade gains (Mexico and Canada), while top-ranked economies like Japan, China and Germany did not enjoy trade at preferential terms. Although, at the time of writing this appears to have the potential to change: the United States *is* in negotiations to form the so-called “Trans-Pacific Partnership” and “Transatlantic Trade and Investment Partnership” that would see six further countries in the top 10 of full-depth trade gains with EIAs with the United States.²⁰

In the following I use the non-realized trade gains, the difference between realized and full-depth trade gains, as a proxy for economic motivations to form EIAs with the respective partner country. As described above, were only these economic motivations at play when policymakers decide to pursue economic integration, the ranking of non-realized trade gains would amount to a list of “low-hanging fruit”. One after another, countries would sign new or deepen existing agreements based on the highest expected trade gains. As this appears not to be the case in the real world, I now explore ways to quantify political motivations.

²⁰These countries are Japan, Germany, United Kingdom, the Netherlands, France and Belgium. South Korea and Taiwan have announced their interest to join subsequently, but are not involved in current negotiations.

1.4 Quantification of Political Motivation

Having obtained estimates for trade gains as the economic motivation behind forming an EIA, I now proceed to constructing the hypothesized second motivation for such agreement: a political motivation. Quantifying political motivations behind the formation of EIAs is a daunting task. Although often an acknowledged aspect in economic transactions of various kinds, finding a proper proxy is marred by the qualitative nature of political exchanges.

In the recent literature a popular way to describe bilateral political relations has been to equate it to an aligned foreign policy, proxied by the similarity of voting patterns in the UN General Assembly with data from Voeten and Merdzanovic (2009). The idea implicitly invokes the “my enemy’s enemy is my friend” rationale. Rose (2007) equates political interest to the geopolitical importance of the bilateral partner for a domestic country and finds the number of embassy staff as an interesting proxy. Umana Dajud (2013) measures political proximity of countries along two axis, the political left/right and authoritarianism/libertarianism, using data from the Manifesto Project (Volkens et al., 2013) on the agenda of political parties in elections and from the Polity IV project (Marshall and Jaggers, 2002), respectively.

I proceed differently in this chapter and follow Pollins (1989) and Desbordes and Vicard (2009) in constructing quantitative measures of bilateral political relations with event data. For this I rely on data from the “Global Database of Events, Language, and Tone” (Leetaru and Schrodt, 2013, GDELT). Almost all of the proxies for political relations described above are not *directional*,²¹ i.e. the measures yield the same value for a country pair from o to d and d to o . This may not be an issue when interested

²¹The exception is the embassy staff count used by Rose (2007).

in how *similar* certain policies or points of view from two countries are, it does matter however when interested in how *important* the countries are for one another. The GDELT dataset allows me to compute such a directional measure. The vast dataset of more than 300 million events since 1979 offers an unsurprisingly very noisy, but incredibly rich view on political events in virtually all countries. The data, which is open source and freely available, is collected via software-read and coded news reports from a variety of international news agencies. Its wealth of data has excited much of the empirical political science for enabling a true testing of political theories,²² but to the best of my knowledge has not yet been used in the economic literature.

Next to the date and link to source articles from major news agencies, each event is geo-, actor-, and verb-coded following the CAMEO taxonomy (Gerner et al., 2002).²³ Verb- and actor-coding yields categorical descriptions of actions and participants by nationality and broad profession/affiliation. As an example, the event “Sudanese students and police fought in the Egyptian capital” is identified as “SUDEDU fought COP” and geo-tagged to Cairo, Egypt. This allows the extraction of information about people (of potentially different countries) involved. Additionally the geolocation can be exploited to verify the “directionality”. Based on the respective verb, each event is classified by the GDELT database into one of the four categories of “material cooperation”, “verbal cooperation”, “verbal conflict” or “material conflict”. Using the information on the date, location, nationalities of actors involved and these four categories, I construct two indices describing the status of the political relationship between two countries: the “mood” and the “importance”.

²²See Gleditsch et al. (2013) for a discussion.

²³Note that each event is only listed once, irrespective the number of articles about the event. The number of publications reporting on the event, however, is an indicator about the veracity of the information.

While the dataset offers daily (and daily updated) information, I aggregate by year, as to reflect to the rather long-term nature of political relationships. While an aggregation to monthly, weekly or even daily data would be possible, it were to exhibit a much higher variance and deteriorate in its purpose of portraying general trends.²⁴ I also restrict the data to international events, where the two actor variables reflect people or entities from two different countries.²⁵ Furthermore, I exclude events that fall below a certain threshold of the number of newspaper articles they are mentioned in.²⁶ In order to ensure the indicators to be representative to a certain degree, I further exclude all country-pair-year observations that fall below a threshold of 10 events. The final dataset comprises 7107095 events. See appendix section A.4 for more detail on the aggregation technique and descriptive statistics.

The mood of the political relations between countries o and d (and vice versa) is defined as

$$\text{Mood}_{odt} = \text{Mood}_{dot} = \frac{(M_{odt}^{cp} + M_{dot}^{cp}) + \frac{1}{3}(V_{odt}^{cp} + V_{dot}^{cp}) - \frac{1}{3}(V_{odt}^{cf} + V_{dot}^{cf}) - (M_{odt}^{cf} + M_{dot}^{cf})}{(M_{odt}^{cp} + M_{dot}^{cp}) + (V_{odt}^{cp} + V_{dot}^{cp}) + (V_{odt}^{cf} + V_{dot}^{cf}) + (M_{odt}^{cf} + M_{dot}^{cf})}$$

where M_{odt}^{cp} is the count of events in a year t initiated in country o towards country d that fall into the category “material cooperation”. V_{odt}^{cp} , V_{odt}^{cf} and M_{odt}^{cf} hence are those counts of “verbal cooperation”, “verbal conflict” or “material conflict” respectively, with the analogous definition for events in d towards o .²⁷ The latter two terms are given negative weights, while the

²⁴Other uses of this data greatly benefit from this detail, such as e.g. Yonamine (2013), who forecasts violence in Afghani districts using GDELT.

²⁵A similar index and aggregation could also be used to measure internal mood and importance of countries.

²⁶Only those events that are mentioned at least as much as the median of any event that took place in the country in a respective month.

²⁷An earlier version of the index was directional, in the sense that only events taking place in country o with respect to country d where counted for Mood_{odt} and only those in country d with respect to o in Mood_{dot} , so that $\text{Mood}_{odt} \neq \text{Mood}_{dot}$. I thank Vincent Vicard for the comment and discussion on this issue.

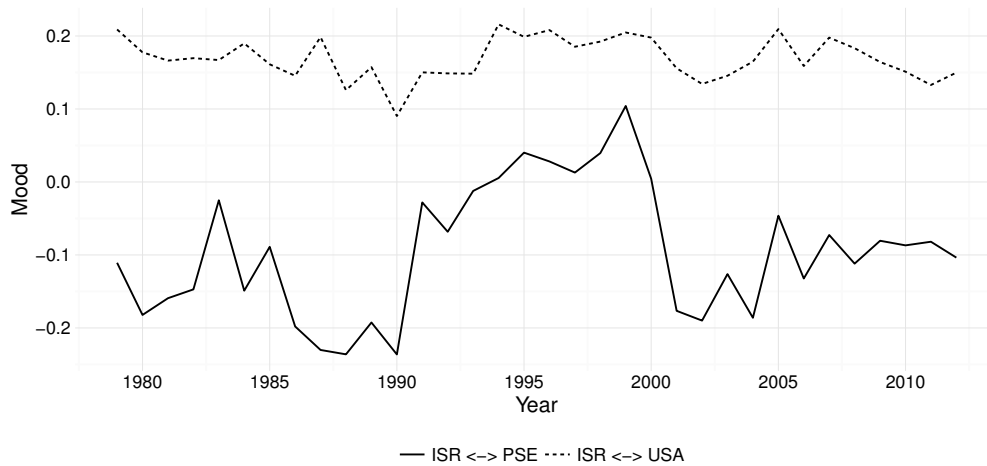


Figure 1.3: Evolution of the bilateral *Mood* between Israel, Palestine and USA

former two are given positive weights, and assuming verbal exchanges to be of less consequence with a weight of one third, the index then describes the mood of political relations on the $[-1, 1]$ interval.²⁸ The choice of using $\frac{1}{3}$ as the weight for “verbal” events is chosen for the equal length of intervals between categories.²⁹

Figure 1.3 shows the evolution of the mood index for the country pair Israel and Palestine, with Israel and USA as a benchmark. The variation of the bilateral moods appears sensible. It vividly shows historical episodes of improving and deteriorating relations: the first Intifada (1987–1993), the Oslo Peace Process up to Camp David (1993–2000), and the second Intifada (2000–2005).

However, the mood of political relations is not all that counts: Relations between countries can be generally positive or negative, but practically irrelevant for one another anyway. I therefore construct a directional index

²⁸Using ratios of the number of category occurrences avoids the “mean” and “sum” pitfalls of event data. See Yonamine (2011) and Lowe (2012) for a discussion.

²⁹Different weighting, as long as the ranking is preserved, does not significantly alter the econometric results.

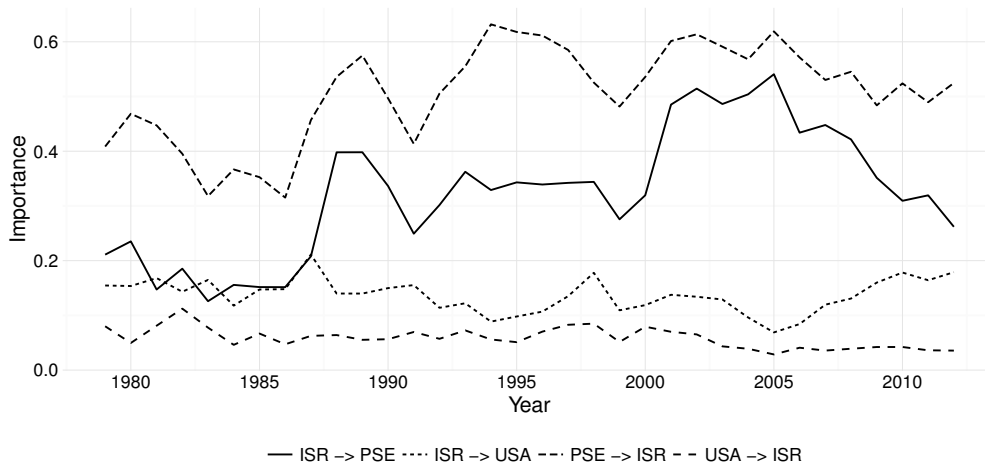


Figure 1.4: Evolution of the bilateral *Importance* between Israel, Palestine and USA

of importance of country d to country o

$$\text{Importance}_{odt} = \frac{M_{odt}^{cp} + V_{odt}^{cp} + V_{odt}^{cf} + M_{odt}^{cf}}{\sum_k M_{ikt}^{cp} + V_{ikt}^{cp} + V_{ikt}^{cf} + M_{ikt}^{cf}}$$

The index reflects the share of events, regardless of the four categories, that took place in country o in year t that involved country d . Figure 1.4 reports the evolution of the importance index again for the country pairs Israel-Palestine and Israel-USA. As expected, the respective bilateral importance do not necessarily closely follow one another, yet again the data series exhibits a variation and different levels that reflect historical episodes of political relations: Israel appears to be more important to Palestine than vice versa, particularly since the end of the second Intifada, while the indices peak in unison in times of strained political relations.

The two indices offer greater detail into the nature of the bilateral relation between countries than previous measures. In fact, “mood” and “importance” explain about 94 % of the variation of aforementioned Voeten and Merdzanovic (2009)’s UNGA similarity index, while being (in part) directional and differentiating between two aspects of relations.³⁰

³⁰See table A.4 in appendix A.4 for the comparison.

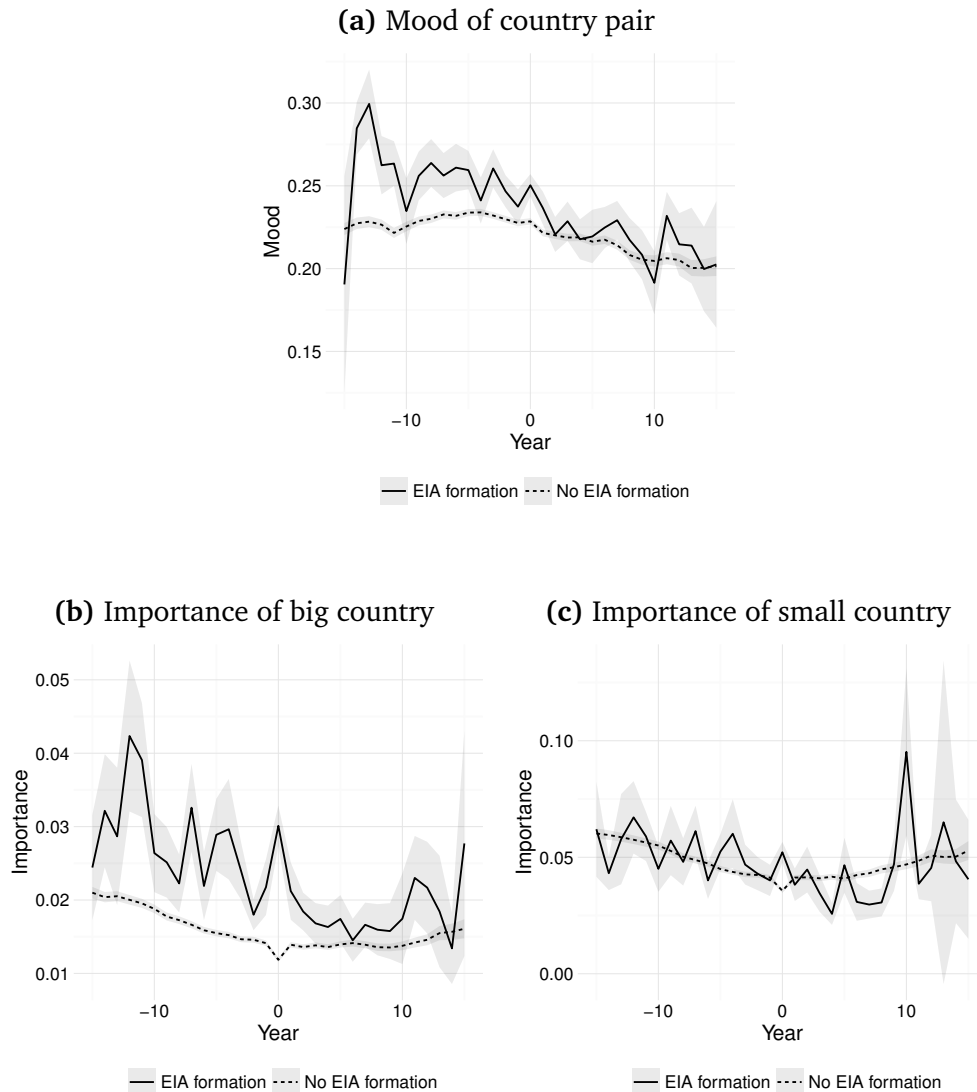


Figure 1.5: Evolution of the mean of *Mood* (a) and *Importance* (c and d) of bilateral relations of big and small countries in future agreement with an EIA partner country and non-partner countries around trade deal at $t = 0$. Gray-shaded area represent the 95% confidence interval.

In the context of this present study the two indices reveal interesting patterns with respect to the formation of EIAs. Figure 1.5a shows the evolution of the mean mood of a country pair that is about to sign an EIA with one another at time $t = 0$ (solid line) compared to other countries (dashed line). The mean mood is significantly better towards the partner

country than towards other countries in the time prior to the agreement, but insignificantly different in the time afterwards. When differentiating between a bigger country and a smaller country—in terms of GDP—at the time the respective country forms an EIA, the importance figure however shows a particularly interesting pattern. Here the picture is heterogeneous for the evolution of the mean of the importance indices for the big towards the small country in figure 1.5b and the small towards the big country in figure 1.5c. Apart from the different levels of importance of a small country for a big country and vice versa, the evolution is different. It appears as though small countries with which a big country is about to form an EIA at a time $t = 0$ are much more important than other small countries. This is different for the inverse case: For small countries there is very little difference between different bigger countries in their respective importance, whether they will be a partner in a future EIA or not. Overall, the data suggests a story in which a larger country could be interested to form an agreement with those smaller countries that are politically more important, while for smaller countries this is not the case. This also gives further plausibility for the assumptions of the model in section 1.2, which gave a big country political interests in small countries, yet not the vice versa.

1.5 Political and Economic Motivations for Economic Integration

With quantitative proxies for both economic and political motivations at hand, I can proceed to address the main question of this chapter: How is trade policy influenced by foreign policy objectives and why do countries form agreements with little trade gains? Who do countries sign economic integration agreements with? I first look at the decision to form an EIA with any country, whether big or small, to detect overall determinants. As suggested by the model in section 1.2 and hinted at by the political

indicators in the section above, I then explore possible heterogeneity between smaller and bigger countries, as measured by their GDP at the time of the formation of an EIA.

1.5.1 Benchmark Regression

As developed above, were policymakers only motivated by economic incentives, trade gains should be able to explain the choice of the partner country when forming EIAs. Armed with proxies for economic motivations and hypothesized political motivations, I estimate the probability of forming an EIA with any given country at time $t + 1$ by regressing the following equation:

$$\begin{aligned} Pr(\mathbf{d}_{od,t+1} > 0 | \mathbf{d}_{od,t} = 0) = & \alpha + \beta_1 \text{Importance}_{odt} + \beta_2 \text{Mood}_{odt} \\ & + \beta_3 \text{Trade gains}_{odt}^{\text{NR}} \\ & + \beta_4 \text{Importance}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} \\ & + \beta_5 \text{Mood}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} + \epsilon_{odt} \end{aligned} \quad (1.16)$$

The dependent variable is the probability that at a time $t + 1$ when o does form an EIA, it does so with country d , i.e. that in time $t + 1$ the depth of integration between o and d , \mathbf{d}_{odt} , is greater than 0, given that it was 0 before. The independent variables are the importance of d for country o at time t , the mood between o and d at time t and the non-realized trade gains o has by not having full-depth integration with d at time t . The interaction terms capture whether the two possible motivations are alternatives or complements. Next to equation (1.16), I also estimate a similar equation with the change in depths of integration, such that

$$\begin{aligned} \mathbf{d}_{od,t+1} - \mathbf{d}_{od,t} = & \alpha + \beta_1 \text{Importance}_{odt} + \beta_2 \text{Mood}_{odt} + \beta_3 \text{Trade gains}_{odt}^{\text{NR}} \\ & + \beta_4 \text{Importance}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} \\ & + \beta_5 \text{Mood}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} + \epsilon_{odt} \end{aligned} \quad (1.17)$$

	Dependent variable:						
	$Pr(\mathbf{d}_{od,t+1} > 0 \mathbf{d}_{od,t} = 0)$				$\mathbf{d}_{od,t+1} - \mathbf{d}_{od,t}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Importance _{odt}	0.257*** (0.047)	3.397*** (0.242)	0.139*** (0.028)	0.193*** (0.030)		0.027** (0.012)	0.390*** (0.069)
Importance _{odt} × Trade gains _{odt} ^{NR}	-0.008** (0.004)	-0.125*** (0.021)	-0.005* (0.003)	-0.002 (0.003)		-0.007** (0.003)	-0.022*** (0.006)
Mood _{odt}	0.008 (0.005)	0.430*** (0.076)	0.006* (0.003)	0.002 (0.003)		0.005** (0.003)	0.010*** (0.003)
Mood _{odt} × Trade gains _{odt} ^{NR}	0.002 (0.002)	0.005 (0.015)	0.001 (0.001)	0.001 (0.001)		-0.004 (0.003)	-0.0003 (0.002)
UNGA Vote similarity _{odt}					0.037*** (0.014)		
UNGA Vote similarity _{odt} × Trade gains _{odt} ^{NR}					0.004*** (0.001)		
Trade gains _{odt} ^{NR}	0.003*** (0.001)	0.023*** (0.005)	0.002*** (0.001)	0.001 (0.0004)	-0.001 (0.0005)	0.003** (0.001)	0.004*** (0.001)
Sample	all	all	all	w/o EU	all	deepening	all
Estimator	OLS	Probit	OLS	OLS	OLS	OLS	IV
Country × Year FE	yes	no	yes	yes	yes	yes	yes
Observations	39,840	39,840	39,801	33,936	38,009	10,539	39,801
R ²	0.445		0.451	0.399	0.459	0.878	0.447
Adjusted R ²	0.380		0.388	0.315	0.395	0.849	0.382
Log Likelihood		-6,624.963					
Akaike Inf. Crit.		13,261.930					

Notes: Robust standard errors in parentheses are clustered by country × year. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table 1.3: Probability of EIA formation and change of depth

The equation is equivalent to the previous one with the exception that also changes in depth are taken into account, i.e. the deepening of existing integration agreements. In both regressions, β_1 and β_2 capture the effect of bilateral political importance and mood, which are expected to be positive. β_3 is also expected to be positive, while the signs of the coefficients on the interactions of political motivations and economic motivations, β_4 and β_5 , could go either way. I estimate equation (1.16) in a linear probability model with an OLS estimator following Wooldridge (2012) and a Probit estimator. The advantage of the LPM estimate is the possibility to control for unobservable covariates with a large set of fixed effects. I therefore include country × year fixed effects in all OLS specifications. Standard errors are clustered at the country-year level.

Table 1.3 columns (1) and (2) report the coefficients for the estimation of equation (1.16). With both estimators, OLS and Probit, the importance variable and trade gains have the expected positive sign and are highly significant. The interaction of the two variables has a negative and significant coefficient, pointing to the two motivations as alternatives. The coefficient for the mood variable is positive in both specifications, but insignificant for the OLS specification, as are the coefficients on the interaction with trade gains. This points to little average impact of the bilateral political mood when picking a partner country for economic integration among possible countries. Table 1.3 column (3) report the coefficients for the estimation of equation (1.17) where the change in depth is the dependent variable. The overall picture is confirmed.

Of concern could be that the results are singularly driven by the European Union, whose declared political goal is an “ever closer union” (EU European Council, 1983). Column (4) reports the coefficients when removing all EU countries. The coefficient on the importance variable remains strongly significant, while, surprisingly, the coefficient on the trade gains variable and its interaction with the interaction variable lose statistical significance. The point estimates still point in the direction as before. As a robustness test to see whether the new indicator for political relations is driving the results, I perform the same regression with Voeten and Merdzanovic (2009)’s often-used indicator on the similarity of UN General Assembly votes by the two countries. I again find a positive and significant impact of political relations and a significant negative coefficient on its interaction with trade gains. A further concern could be that the results are driven by the initial formations of EIAs and less so or not at all by the deepening of existing ones. In column (6) I report the results for only these cases of deepened EIAs. While the coefficient for importance drops by an order of magnitude, it remains significant. All other estimated coefficients are similar to those in the other specifications and remain significant.

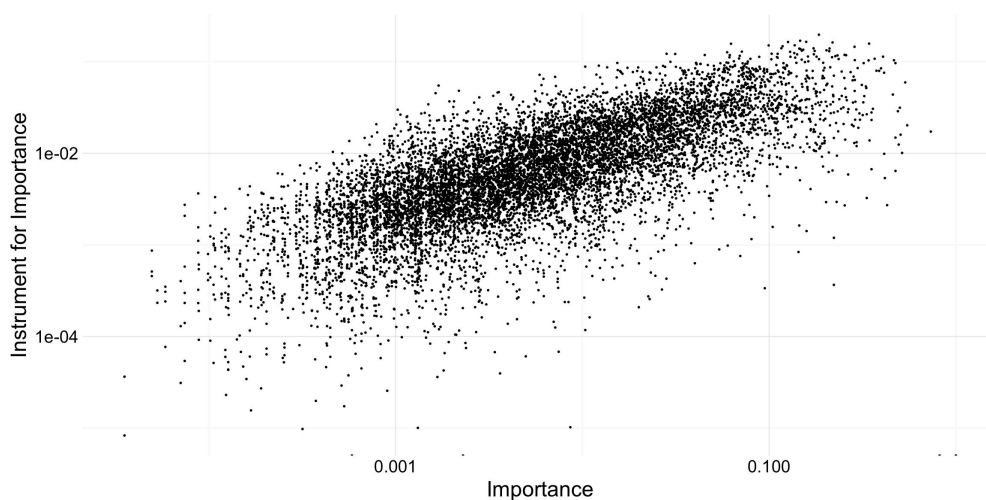


Figure 1.6: Importance measure vs. instrument for importance

The previous specifications, however, do not address the potential endogeneity of political relations to (negotiations for) economic integration—the importance measure in particular comes to mind. I address this concern by following an instrumental variable strategy that is inspired by the literature on the identification of peer effects on individuals’ economic outcomes. Bramoullé et al. (2009) show that certain network structures of social networks of individuals can be used for the identification. As countries’ bilateral political relations can easily be thought of as a social network among countries, I adapt to the current setting one of these proposed network structures: Friends of friends, that are not friends themselves, i.e. a network with *intransitive triads* (Bramoullé et al., 2009). I therefore instrument country d ’s importance to a country o by aggregating all other countries’ $k \setminus \{o, d\}$ importances towards d , weighted by country o ’s importance towards $k \setminus \{o, d\}$, such that $\sum_{k \setminus \{o, d\}} (\text{Importance}_{okt} \cdot \text{Importance}_{kdt})$. Given a matrix of importances between all countries \mathbf{A} and a zero diagonal, the instrument is easily computed as the matrix product $\mathbf{A}\mathbf{A}$. Figure 1.6 shows a strong correlation between the importance measure and the instrument. At the same time, it is highly unlikely that negotiations between two countries systematically affect bilateral political relations of the two affected countries with all other countries. Column (7) of table 1.3 shows

the coefficients for the IV estimation, confirming the previous results. The results for the first stage are displayed in table A.5 in appendix A.5. The F-statistic on the instruments are well above the customary threshold of 10 for strong instruments.

1.5.2 Heterogeneity in Motivations

As discussed above, the model in section 1.2 predicts a heterogeneity in the motivations for economic integration, depending on whether a country is a “senior” or “junior” partner in the agreement. Figure 1.5 gave a first hint that these “average” results may shield important heterogeneity in the motivations. As suggested, *bigger* countries might sign EIAs with *smaller* countries for political purposes. To test this proposition, I dichotomize the sample by size of GDP at the time of the formation of the agreement, so as to have a big and small country as the two countries pursuing economic integration. I then re-estimate equations 1.16 and 1.17 and include proxies for political and economic motivations from both countries. The regression for the probability to form a new agreement then yields

$$\begin{aligned}
 Pr(\mathbf{d}_{od,t+1} > 0 | \mathbf{d}_{od,t} = 0) = & \alpha + \gamma_1 \text{Importance}_{odt} + \gamma_2 \text{Importance}_{dot} \\
 & + \gamma_3 \text{Mood}_{odt} + \gamma_4 \text{Trade gains}_{odt}^{\text{NR}} \\
 & + \gamma_5 \text{Trade gains}_{dot}^{\text{NR}} \\
 & + \gamma_6 \text{Importance}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} \\
 & + \gamma_7 \text{Mood}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} \\
 & + \gamma_8 \text{Importance}_{dot} \times \text{Trade gains}_{dot}^{\text{NR}} \\
 & + \gamma_9 \text{Mood}_{dot} \times \text{Trade gains}_{dot}^{\text{NR}} + \epsilon_{odt} \quad (1.18)
 \end{aligned}$$

where the variables and coefficients have the equivalent interpretations as above. The difference here is that *o* is a bigger country, *d* a smaller country, so that now all variables subscripted *dot* denote those for the smaller partner country. Again I also estimate a corresponding equation

for a change in depths of integration, so that equation 1.17 here becomes

$$\begin{aligned}
\mathbf{d}_{ij,t+1} - \mathbf{d}_{ij,t} = & \alpha + \gamma_1 \text{Importance}_{odt} + \gamma_2 \text{Importance}_{dot} \\
& + \gamma_3 \text{Mood}_{odt} + \gamma_4 \text{Trade gains}_{odt}^{\text{NR}} \\
& + \gamma_5 \text{Trade gains}_{dot}^{\text{NR}} \\
& + \gamma_6 \text{Importance}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} \\
& + \gamma_7 \text{Mood}_{odt} \times \text{Trade gains}_{odt}^{\text{NR}} \\
& + \gamma_8 \text{Importance}_{dot} \times \text{Trade gains}_{dot}^{\text{NR}} \\
& + \gamma_9 \text{Mood}_{dot} \times \text{Trade gains}_{dot}^{\text{NR}} + \epsilon_{odt} \quad (1.19)
\end{aligned}$$

The interpretation of the variables and coefficients is equivalent to those of equation (1.18) above. In the current context, when dichotomizing the sample, the importance of the small country for the bigger country, i.e. Importance_{odt} , is assumed to have a positive effect, while that of the big country for the smaller country, i.e. Importance_{dot} , less so. All regressions include fixed effects for big and small country by year to account for unobservables. Standard errors are clustered at the same level.

Table A.6 in appendix A.5 shows the results for a number of different specifications of estimating equation (1.18), i.e. estimating the determinant of the probability to sign a new EIA. The coefficients for the benchmark estimation in column (1) show the expected signs: The more important a small country is for the big country and the greater the trade gains, the greater the probability to form an EIA in the following year. Trade gains for the small country are positive and significant as well, while the importance of and bilateral mood with the big country is not. In column (2) I interact the variables for political and economic motivations and introduce standard gravity covariates to control for potential unobserved variables. All variables of interest have the expected sign: the importance of the small country for the big country is positive and significant, as are expected trade gains. The interaction of the two is positive, however not significant. On the other side, mood and trade gains have a positive and significant

impact, while the importance does not. The included gravity covariates are in line with previous results from Martin et al. (2012), who also find that a common colonial history and recent previous conflict decrease the probability for enter a new agreement. In column (3), when including next to country \times year fixed effects also country-pair fixed effects that remove a lot of the variation, coefficient remain largely unchanged. The importance variable for the big country loses its significance, however the coefficient on trade gains and its interaction term with importance is highly significant. The interpretation is therefore the same, as for a given level of trade gains the political importance is less a determinant of the probability to form an EIA. In order to test whether anticipation effects of an impending agreement could drive the results, column (4) reports the coefficient when re-estimating equation (1.18) with 10-year lagged variables.³¹ In column (5) I report another robustness test and, as in table 1.3, perform the analysis with the similarity of UN General Assembly voting. In column (6) finally I report the estimation using the same IV strategy as in the previous section.³² All results clearly support the narrative sketched in the theoretical part in section 1.2 of alternative motivations for economic integration, between trade gains and political importance, for big countries. Small countries, on the other hand, appear to be largely indifferent between choices of potential contracting partners.

Table A.7 in appendix A.5 shows the analogous results for the estimation of equation (1.19), i.e. the change in depth as the dependent variable. Overall, while in some cases different in magnitude, the point estimates are very similar to the ones of estimating the probability of forming a new agreement, so that the overall narrative is confirmed. The results point in the same direction: while overall the bilateral political importance appears to be an important determinant of economic integration next to expected trade gains, there exists substantial heterogeneity between countries.

³¹No economic integration agreement comes to mind, whose negotiations stretched over a decade. Shorter lags produce very similar results.

³²See the table A.8 in appendix A.5 for the first stage regression.

Bigger countries, as measured by GDP, appear to weigh the alternatives of political and economic motivations, while for smaller countries political importance of the bigger country is less determining. Reaffirming the results by Martin et al. (2012), foreign policy considerations are a major determinant of the geography of economic integration. Contrary to Martin et al., though, previous conflict is only one of several potential avenues for politics to shape economic integration. Geopolitical importance of smaller countries to bigger countries appear to be alternatives to potential trade gains, making trade policy a tool of foreign policy.

1.6 Conclusion

Economic determinants of economic integration agreements have received ample attention in the economic literature, while political motivations for such agreements have not received as much focus. However, looking at the rapid evolution of the geography of EIAs over the past two decades, it becomes apparent that there is more to trade policy than “just trade”. While recent research establishes a connection between trade policy and a reduction of conflict, this chapter suggests a different narrative: trade policy, in the form of EIAs, is used as an instrument of foreign policy. Smaller, but politically important countries are likelier to integrate economically with a bigger country than their economic attractiveness warrants.

Building on previous work by Limão (2007) on non-traditional determinants for preferential trade agreements, I sketch a model that exhibits the mechanism in which political considerations are alternatives to economic benefits from economic integration. The model puts forward two testable propositions: Under the given assumptions, “big” countries may weigh economic gains against political motivations from integration, while smaller countries remain indifferent to the partner country’s motivations.

I test these propositions on the choices of partners in EIAs by estimating trade gains of hypothetical EIAs as a function of their *depth* and introducing two new indicators for political relations between countries. I construct an index of depth of integration that allows for heterogeneity of different stages of economic integration and estimate the elasticity of trade to this depth of integration in a gravity framework. I then compute non-realized trade gains of hypothetical deeper integration between any given country pair as a proxy for the economic motivations to integrate further.

Aside from the theoretical and empirical results, the developed proxies for bilateral political relations, “importance” and “mood”, are the main contributions of this chapter. As the qualitative nature of political relations is notoriously difficult to quantify, I turn to the vast political event dataset provided by GDELT (Leetaru and Schrod, 2013) that has so far not been used in the literature in empirical economics. From the dataset I extract political events with participants of different countries and derive directional indicators for the “importance” of and “mood” between countries. These two indices are then used to proxy political motivations for economic integration.

Finally I estimate the impact of the two hypothesized determinants on the probability of forming a new agreement and on changes to the depth of integration. As suggested by the model, political considerations are an important predictor for the choice of partnering countries for economic integration. This effect is not homogeneous though: The political importance of a smaller country—as measured in terms of GDP—for a bigger country is more decisive than vice versa. Furthermore, economic and political motivations for economic integration are shown to be alternatives rather than complements.

While this contribution provides a new and more precise quantification of political relations, it remains difficult to capture the qualitative nature of politics and its influence on trade policy. However, as “big data” becomes more abundant, new ways to quantify previously unattainable qualitative details emerge that allow to answer old and new questions related to the topic at hand: How does public opinion shape a country’s trade policy? What is the role of multinational corporations in this respect? As at the time of writing the Transatlantic Trade and Investment Partnership and the Trans-Pacific Partnership are being negotiated, both of which are unprecedented in depth and further blur the line between political and economic agreement, these questions become ever more pressing. Further research will surely aim to study them.

2

Collateral Damage: The Impact of the Russia Sanctions on Sanctioning Countries' Exports¹

2.1 Introduction

“Smart sanctions,” the trade and financial sanctions, are some of the current favorites in the toolbox of foreign policy. Meant to hurt the target country’s economy through restrictions or bans on the trade of certain goods and services, severance of financial ties, or an all-out embargo, these sanctions are used when diplomacy fails, while military options appear too drastic. However, sanctions also affect the sender country: For domestic exporters and importers the cross-border transfers of goods and money are made more costly.

¹Joint work with Matthieu Crozet (Univ. Paris Sud, University Paris Saclay and CEPII; E-mail: matthieu.crozet@gmail.com). We are grateful to Banu Demir, Julien Martin and Florian Mayneris for generously sharing their data with us. We would also like to thank Jezabel Couppey, Keith Head, Sebastien Jean, Claire Lelarge, Ariell Reshef, and participants at seminars at CEPII, Paris 1 University, Univeristy Paris Sud, University of Düsseldorf, the Chinese University of Hong Kong and Milano Bicocca for fruitful discussions and comments.

The aim of this chapter is to investigate the effect of sanctions on the *sender* country's economy. We analyze the case of the diplomatic conflict beginning in 2014 between 37 Western countries (including all EU countries, the United States and Japan) and the Russian Federation over the political and military crisis in the Ukraine. Following the alleged involvement in separatist movements in eastern Ukraine and the annexation of Crimea after the "Maidan Revolution" in the winter of 2013–2014, these 37 countries levied sanctions on the Russian Federation starting in March of 2014. The measures were intensified in July 2014. Russia then retaliated by imposing an embargo on certain food and agricultural products. The strength of the pre-sanction economic ties—in 2012 Russia accounted for about 2.3% of all sanctioning countries' exports and 63.8% of Russian exports were destined for sanctioning countries—makes this episode unprecedented and particularly instructive. These aggregate numbers, however, mask the important heterogeneity in the bilateral importance of trade relations, as 19.9% of Lithuanian exports went to Russia, but only 0.7% were from the United States.

We conduct the analysis from two perspectives. We first gauge the global effects in a gravity setup, highlighting the heterogeneous impact on the different sanctioning countries involved. Using monthly trade data from 78 countries, we perform a general equilibrium counterfactual analysis that allows us to estimate precisely the loss of exports to Russia resulting from the military conflict in the Ukraine, the Western sanctions, and the Russian retaliation. In order to gain a deeper understanding of the root causes of this global impact, we then study how firms reacted to the sanctions using a rich dataset of monthly French firm-level exports. We estimate the effects on the intensive and extensive margins and examine possible channels through which firms' exports are affected. Finally, we analyze whether firms were able to partially recover their incurred losses by diverting their sales to alternate destinations.

The use of sanctions as a foreign policy tool has attracted substantial literature in both political science and economics. The bulk of the existent work has shed light on the determinants of the success or failure of such policies and the effect of sanctions on the *target* economy through which the intended outcome—change of certain policies—is supposed to work. Drezner (1999), van Bergeijk (2009) and Hufbauer et al. (2009) provide instructive overviews over the state of research in this respect.² For empirical analyses, Hufbauer et al. (2009) also provide a thorough record of sanctions cases, with an emphasis on American- and European-imposed sanctions. The TIES database by Morgan et al. (2009) provides a second and very detailed source for sanctions encompassing more sender and target countries. Both datasets provide quantitative measures on the scope and intensity of applied measures, and attempt to judge their success or failure with respect to their political aims.³ Caruso (2003) estimates the average effects of sanctions in the second half of the 20th century in a simple *naïve* gravity setup on aggregate trade flows.

A number of papers have looked at the economic impact of sanctions in *sending* countries. The case of the Embargo Act of 1807 is particularly well studied, as it provided the first use of sanctions and embargoes in the modern era. Frankel (1982), Irwin (2005), and O'Rourke (2007) find effects in the range of 4%–8% of U.S. GDP by looking at trade losses and commodity price changes. Hufbauer and Oegg (2003) look at macroeconomic effects of sanctions in place in the 1990s and find the total effect on U.S. GDP to hover around a much lower 0.4%. Others look at the economic impact on the *target* economy. Related to our work, Dreger et al. (2015) also evaluate the economic impact of the sanction regime between Western countries and the Russian Federation. While we focus on the

²See also Rosenberg et al. (2016) and Drezner (2011) for analyses of *smart sanctions*, the use of targeted travel bans and asset freezes against individuals, which were also used by Western countries in the beginning of the diplomatic conflict with Russia.

³We refrain from following their lead and *do not* make a statement on whether the sanctions achieve their intended political aims, we leave this feat to political scientists and pundits.

impact on trade flows, they estimate the consequences of the sanctions on the Russian macroeconomic performances. Dizaji and van Bergeijk (2013) study the macroeconomic and political impacts on Iran while aiming to quantify the effectiveness of the sanctions' regime. Also looking at the case of the Western-imposed sanctions on Iran, Haidar (2014) studies the impact of sanctions using firm-level data and employing an approach similar to ours.

This chapter is also related to the literature studying the link between conflict and trade. Martin et al. (2008a) and Martin et al. (2008b) analyze the prevalence and severity of interstate and civil wars through the lens of trade economists. They show that multilateral trade openness increases the probability of escalation with another country, while direct bilateral trade deters it. Similarly, small-scale civil wars are shown to be fueled by trade openness while it decreases the probability of large-scale strife. Glick and Taylor (2010) show the disruptive effects of war on international trade and economic activity in general.⁴ Their approach—comparable to ours—relies on a gravity setup and they quantify the losses by accounting for changes in bilateral and multilateral resistances.⁵ Another strand of the literature analyzes changes in the consumer preferences following political shocks. Fuchs and Klann (2013) show that high-level meetings with the Dalai Lama are costly for the hosting country, in the sense that bilateral trade with China is significantly reduced in the following year. Michaels and Zhi (2010) show that the diplomatic clash between France and the United States over the Iraq War in 2003 reduced significantly the trade between the two countries during a short period of time. Pandya

⁴We derive the title of this chapter from their paper. For us, however, “collateral damage” has a slightly different meaning. We define it as the loss of trade incurred by the sender countries of sanctions.

⁵Head and Mayer (2014) remark that this does not in fact constitute the general equilibrium impact, as it does not account for changes to production and expenditure. Head and Mayer and Anderson and Yotov (2010) coin this the *modular trade impact*. In our analysis below we explicitly do account for changes in production and expenditure figures, following and extending approaches by Dekle et al. (2007, 2008) and Anderson et al. (2015).

and Venkatesan (2016) exploit scanner data to reveal that sales in the U.S. market of brands marketed to appear French, while not necessarily imported from France, were affected by this conflict. Heilmann (2016) studies the impact of various boycott campaigns, among others the boycott Danish products in some Muslim-majority countries in 2006 by using a synthetic control group methodology. Studying the reaction of firms to the sanctions' regime, our study additionally contributes to the recent and active literature on exporter dynamics in rapidly changing environments responding to economic shocks. Berman et al. (2012) find a heterogeneous reaction of French firms to real exchange rate movements. Berman et al. (2015) go on to show that *learning* about local demand—and hence firm age and experience—appears to be a key mechanism of exporter dynamics. Relatedly, Bricongne et al. (2012) identify credit constraints as an aggravating factor for firms active in sectors of high financial dependence when faced with a sudden shock.

Chapter 2 sets itself apart from the existing literature on sanctions by focusing on the impact of sanctions from the perspective of the *sender* country's economy. By doing so, we shed light on the importance of possible collateral damage of these diplomatic tools, i.e., the costs that sanctioning countries can inflict on themselves. We also contribute to the literature on exporter dynamics by highlighting the impact of the shock to trade finance through financial sanctions as a key mechanism. We assess the effect of the sanctions regime vis-a-vis the Russian Federation from two angles: Using monthly UN Comtrade data, we evaluate the broad impact on exports to the Russian Federation by all major trading partners—sanctioning or not—in a structural gravity framework. We find the overall costs to total US\$60.2 billion from the beginning of the conflict until mid-2015, with 76.7% incurred by EU countries. Importantly, the products that are targeted by the Russian embargo account only for a small fraction of the total loss. This suggests that most of the impact of the diplomatic conflict on exports can be considered as collateral damage. We then go further (and more micro) by using monthly French firm-level

data and evaluate the effects on French firms. We find that the sanctions have decreased the individual firm's probability of exporting to Russia, the value of shipments, and their price. Furthermore, between boycotts, country-risk, and trade finance, the latter is found to best explain the stark decrease in French firms' exports.

The chapter is structured as follows: section 2.2 provides a brief overview of the sanctions' regime that affected trade flows between sanctioning countries and the Russian Federation. In section 2.3, we estimate the global country-level impact of the sanctions' regime in a gravity framework and quantify the "lost trade" with a general equilibrium counterfactual analysis. In section 2.4, we then focus on the firm-level, identifying effects on intensive and extensive margins and disentangle different channels of impact at the firm-level using French customs data. In section 2.5, we explore possible trade diversion effects. Section 2.6 provides the conclusion.

2.2 Western Sanctions and the Russian Embargo

The Western sanctions against the Russian Federation and their counter-sanctions are rooted in the simmering conflict in the eastern Ukraine and the Crimea. In this section, we try to give an overview over the developments that led to the introduction of sanctions and discuss the measures. Broadly speaking, the episode can be broken down into three periods, a conflict period in which tensions started to grow between December 2013 and February 2014, followed by a period of "smart sanctions" starting in March 2014. A third period then started in August 2014 with the implementation of both Western economic sanctions in the form of trade restrictions and financial sanctions, and the Russian embargo on imports of food and agricultural products from the 37 sanctioning countries.

In the following discussion, we denote as “sanctioning country” all countries that enacted smart and economic sanctions against the Russian Federation and were thus the target of Russian counter-sanctions. As “embargoed products,” we define all products that were targeted by *Russian* counter-sanctions—an import embargo on certain agricultural and food products. Western economic sanctions were almost exclusively aimed at Russian financial institutions and did not target any *commonly* traded goods in particular. Those exports of highly specialized goods that were prohibited by Western countries were excluded from the analysis below, as trade in these goods is very granular.⁶

Aside from all EU member states and the United States, Norway, Albania, Montenegro, Georgia, Ukraine, Moldavia, Canada, Australia, New Zealand, and Japan enacted similar policies.⁷ Switzerland, historically politically neutral, enacted legislation that made it more difficult to circumvent sanctions, e.g., by transshipping European exports and imports through the country, yet did not introduce any of its own measures. Figure 2.1 shows a map of countries imposing sanctions towards the Russian Federation and being exposed to counter-sanctions. In terms economic size, countries sanctioning the Russian Federation totaled roughly 55.2% of the 2014 world GDP.

2.2.1 Origins of the Conflict and Growing Tensions

In 2013, the eastern European country of Ukraine faced an apparent dilemma: either sign and conclude an Association Agreement with the

⁶As detailed below, Western trade sanctions did apply for goods originating from or destined for Crimea. However, as flows to and from Crimea were previously recorded as Ukrainian, their exclusion does not affect the analysis below. For a discussion of the products affected by Western sanctions, military dual use, and certain manufacturing goods used in oil production and refinery, see section 2.3.

⁷The exact timing of the enacting of sanctions varies by country, but all did so until the end of August 2014.

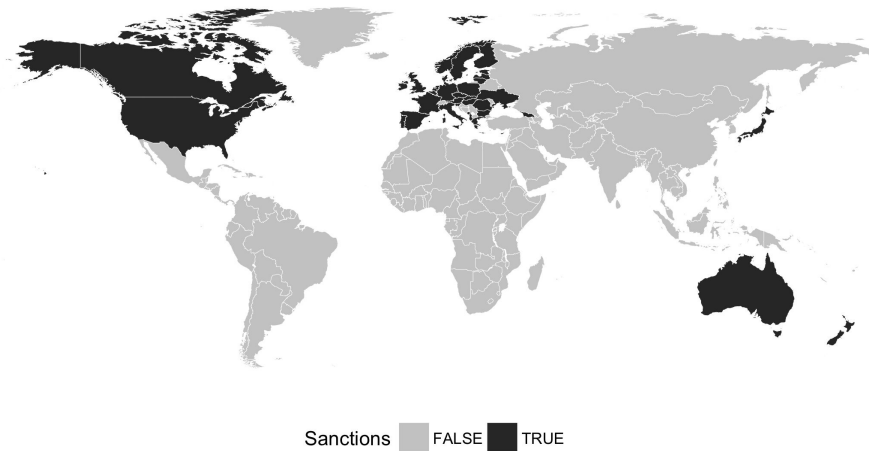


Figure 2.1: Countries imposing sanctions against Russia and being subject to counter-sanctions

European Union (EU)⁸ or accede to the Eurasian Customs Union.⁹ The former would entail closer ties to “the West” and economic integration with the EU. The latter would lead to stronger economic integration with the Russian Federation and other former members of the Soviet Union, strengthening the historical bonds already in place. While on the surface both options appeared to be of economic consideration, the implications would run much deeper. Economic integration goes hand in hand with political and geopolitical ties (Martin et al., 2012) and thus the domestic and international political debate turned more heated quickly.¹⁰

Ukraine is a multi-lingual and multi-ethnic country. In late 2013, the ruling government’s decision against further economic and political integration with the EU led to an important wave of demonstrations in Kiev

⁸The European Union has formed numerous so-called Association Agreements as part of its broader neighborhood policy. These agreements entail the development of economic, political, social, cultural, and security links (Smith, 2013).

⁹Ukraine already became observer to the Eurasian Customs Union in the summer of 2013 (Reuters, 2013). See Dragneva and Wolczuk (2012) for more on the Eurasian Customs Union.

¹⁰Already in August 2013, Russia voiced its opposition to Ukraine’s ambition to form an Association Agreement with the European Union and blocked virtually all imports from the Ukraine (Popescu, 2013; AP, 2013).

and the western part of the country. This protest movement known as the “Euromaidan” led to the overthrow of the sitting Ukrainian government on February 22, 2014.¹¹ The overthrown government headed by President Yanukovic was perceived as pro-Russian, drawing most of its support from the majority Russian-speaking regions of eastern and southern Ukraine. The “Euromaidan” was, in contrast, by and large pro-European or nationalist, drawing most of its support from the rest of the country (Dreyer et al., 2015). This political split turned increasingly violent, with the EU and United States siding with the “Euromaidan” and the Russian Federation supporting the rivaling factions.

2.2.2 First Two Waves: Smart Sanctions

The situation deteriorated further in southeastern Ukraine, in particular on the peninsula of Crimea. On February 27, 2014 separatists and armed men seized key government buildings and the main airport, and on March 16, 2014 a much-criticized referendum was held that aimed at the absorption of the Crimea into the Russian Federation (Dreyer et al., 2015). European and allied Western countries, most prominently the United States, imposed the first sanctions on the Russian Federation in mid-March 2014. This initial first wave of sanctions from Western countries, dubbed smart sanctions, focused on implicated political and military personnel as well as select Russian financial institutions (Ashford, 2016). A second wave in the weeks to follow expanded the list of sanctioned individuals and entities.

The first and second wave of EU sanctions consisted of travel bans and asset freezes on several officials and institutions from Russia and Ukraine. The initial measures were implemented through *Council Decision 2014/145/CFSP* and *Council Regulation (EU) No 269/2014* on March 17, 2014 and amounted to an “EU-wide asset freeze and travel ban on those undermining the territorial sovereignty or security of Ukraine and those

¹¹See also (Dreyer et al., 2015, pp. 44-47) for a timeline of events surrounding the 2014 Ukrainian revolution and subsequent conflict in eastern Ukraine and Crimea.

supporting or doing business with them.” The list of targeted individuals and entities was first amended with *Council Implementing Decision 2014/151/CFSP* and *Council Implementing Regulation (EU) No 284/2014* on March 21, 2014 to 33 persons and then extensively appended with what was called the second wave of sanctions with *Council Implementing Decision 2014/238/CFSP* and *Council Implementing Regulation (EU) No 433/2014* on April 28, 2014. Until the end of 2015, this list of persons was amended 12 times.¹²

The U.S. sanctions, implemented by *Executive Orders 13660, 13661 and 13662*, targeted individuals or entities in a way such that “[...] property and interests in property that are in the United States, that hereafter come within the United States, or that are or hereafter come within the possession or control of any United States person (including any foreign branch) of the following persons are blocked and may not be transferred, paid, exported, withdrawn, or otherwise dealt in” while also “suspend[ing] entry into the United States, as immigrants or nonimmigrants, of such persons” (Kleinfeld and Landells, 2014, Executive Order 13662). Such asset freezes and travel bans were extended to a growing list of persons and entities, including major Russian financial institutions with close links to the Kremlin (Baker and McKenzie, 2014).¹³

Other countries allied with the European Union and the United States followed a similar path and introduced comparable measures at around the same time.¹⁴ These lists of individuals and entities were successively appended over the spring and summer of 2014.¹⁵

¹²See http://www.consilium.europa.eu/en/press/press-releases/2015/09/pdf/150915-sanctions-table---Persons--and-entities_pdf/ for a list of currently sanctioned people and entities.

¹³See the current *Sectoral Sanctions Identifications List* of the United States Office of Foreign Assets Control here <https://www.treasury.gov/ofac/downloads/ssi/ssi.pdf> and the list of *Specially Designated Nationals* here <https://www.treasury.gov/ofac/downloads/sdnlist.pdf>.

¹⁴See https://en.wikipedia.org/wiki/List_of_individuals_sanctioned_during_the_Ukrainian_crisis for a list of sanctioned individuals by the respective countries.

¹⁵Compare, e.g., Ashford (2016) and Dreger et al. (2015).

The Russian Federation condemned the measures and on March 20, 2014, the Ministry of Foreign Affairs issued travel bans on nine high-ranking and influential U.S. politicians and officials.¹⁶ Three days later, 13 Canadian politicians and officials were targeted in a similar fashion and on May 27, 2015, a *blacklist* of 89 politicians and activists from European Union member states emerged.¹⁷

2.2.3 The Third Wave: Trade Restrictions and Financial Sanctions

After the crash of a civilian airplane (the Malaysian airlines flight MH17), shot down over the separatist region of Donbass with the probable implication of pro-Russian insurgents, trade sanctions were levied and existing financial restrictions further expanded. This third wave of EU sanctions went beyond previous measures in depth and scope. Not only were Russian individuals and entities targeted, but European entities were restricted from exporting certain goods and buying certain Russian assets (Dreger et al., 2015).¹⁸ The restrictions were enacted through *Council Decision 2014/512/CFSP* and *Council Regulation (EU) No 833/2014* on July 31, 2014.¹⁹ European exporting firms were still mostly indirectly affected, as

¹⁶See http://archive.mid.ru//brp_4.nsf/newsline/1D963ACD52CC987944257CA100550142 and http://archive.mid.ru//brp_4.nsf/newsline/177739554DA10C8B44257CA100551FFE. Among them, then Speaker of the United States House of Representative, John Boehner, the second in Presidential line of succession, then Senate Majority Leader Harry Reid, former Presidential candidate John McCain, as well as three assistants to the President (RT, 2014).

¹⁷See <http://www.theglobeandmail.com/news/politics/russia-bans-entry-to-13-canadians-in-retaliation-for-ottawas-sanctions/article17635115/> and <http://uk.reuters.com/article/russia-europe-travelban-idUKL5N0YL07K20150530>.

¹⁸On June 23, 2014 the EU already enacted measures banning imports of goods originating in Crimea through *Council Decision 2014/386/CFSP* and *Council Regulation (EU) No 692/2014*. However, these are usually not regarded as the “third wave” of sanctions, as they did not target Russia proper. Bans on imports from Crimea were later amended by *Council Decision 2014/507/CFSP* as further trade bans designed to prohibit the development of infrastructure and industry, and later by *Council Decision 2014/386/CFSP* by expanding the restrictive measures to tourism.

¹⁹The “third wave” had been in the making—publicly—for sometime then, presumably as a threat, see <http://www.euractiv.com/section/global-europe/>

only a small number of industries' exports were directly targeted: Those firms that export products and technology intended for military and dual use and some equipment for the oil industry.²⁰

The U.S. State Department announced a “third wave” of sanctions on July 17, 2014, stating that the US Treasury Department had “imposed sanctions that prohibit U.S. persons from providing new financing to two major Russian financial institutions [...] and two Russian energy firms [...], limiting their access to U.S. capital markets”, as well as “eight Russian arms firms, which are responsible for the production of a range of materiel that includes small arms, mortar shells, and tanks.”²¹ On July 29, 2014, these were broadly expanded, with the State Department announcing that new measures prohibited U.S. persons from “providing new financing to three major Russian financial institutions,” while at the same time “suspend[ing] U.S. export credit and development finance to Russia.”²² Further amendments in the same vein were announced on September 9, 2014.²³

The Russian side, unsurprisingly, retaliated and enacted sanctions on European and other sanctioning countries. On August 7, 2014, the Russian Federation imposed a ban on imports of certain raw and processed agricultural products as an “application of certain special economic measures to ensure the security of the Russian Federation.”²⁴ The targeted products

[news/eu-prepares-more-sanctions-against-russia/](http://www.euractiv.com/analysis/2014/07/17/eu-prepares-more-sanctions-against-russia/). The US had implemented its measures on 17 July 2014 already and were pushing EU leaders to reciprocate, see <http://www.themoscowtimes.com/business/article/new-sanctions-wave-hits-russian-stocks/503604.html>.

²⁰Military use products are defined in the so-called *common military list* as adopted through *Council Common Position 2008/944/CFSP* and dual use goods through *Council Regulation (EC) No 428/2009*. See appendix table B.2 for the affected HS 8 codes.

²¹See <https://www.treasury.gov/press-center/press-releases/Pages/j12572.aspx>. Additionally previous “smart sanctions” were extended to more individuals and entities, including the two Ukrainian break-away regions “Luhansk People’s Republic” and the “Donetsk People’s Republic”.

²²See <https://www.treasury.gov/press-center/press-releases/Pages/j12590.aspx>.

²³See <https://www.treasury.gov/press-center/press-releases/Pages/j12629.aspx>.

²⁴See the *Russian President’s Decree No. 560 of August 6, 2014* and the *Resolution of the*

(henceforth the “embargoed products”) were select agricultural products, raw materials and foodstuffs originating from the European Union, the United States, Canada, Australia and Norway:

- meat and meat products (HS headings 0201 to 0203 and 0207)
- certain types of fish and related products (HS headings 0302 to 0308)
- milk and dairy products (HS headings 0401 to 0406)
- certain types of vegetables (HS chapter 07, fruit and nuts of HS headings 0801 to 0813)
- sausages and similar products (HS headings 1601)
- certain other food products (HS headings 1901 and 2106)²⁵

The list of banned products was been modified on August 20, 2014 and other sanctioning countries were successively included.²⁶

Other Western countries reciprocated the measures taken by the United States and European Union and enacted similar trade sanctions and financial restrictions (Dreger et al., 2015; Dreyer et al., 2015). The Swiss government enacted further legislation that was meant to prevent circumvention of existing sanctions, while maintaining not to impose direct sanctions on the Russian Federation and as such was not affected by Russian counter-sanctions (Reuters, 2014).²⁷ All measures, from the Western and the Russian side, were extended multiple times and are in place until at least July 2016.

Government Of the Russian Federation No. 830 of August 20, 2014.

²⁵Compare <http://www.bakermckenzie.com/sanctionsnews/blog.aspx?entry=3508>.

²⁶See appendix table B.3 for the 4 digit HS codes targeted.

²⁷See also the Swiss *Verordnung über Massnahmen zur Vermeidung der Umgehung internationaler Sanktionen im Zusammenhang mit der Situation in der Ukraine, AS 2014 877*. As a Schengen member state, all travel bans automatically included travel to Switzerland.

2.3 The Big Picture: Global Impact of Sanctions on Russia

We first investigate the global impact of the sanctions' regime against Russia using country-level data to gauge the overall consequences, before analyzing their different dimensions using firm-level data in section 2.4. We do so by relying on a simple theoretical framework that yields consistent gravity equations at the firm and country level. The different sets of sanctions imposed by the EU and other countries, on the one hand, and by Russia, on the other hand, enter as a *bilateral* trade cost. As such, our approach is similar to Hufbauer et al. (2009), but improves upon the theoretical foundation of the model.²⁸

We estimate the partial equilibrium effects of sanctions and then quantify the “lost trade” due to the sanctions episode in a general equilibrium counterfactual framework. Our approach requires no additional data next to trade flows by fully relying on estimated fixed effects. This makes the estimations consistent with theory and immune to data collection issues. For information on bilateral trade flows, we rely on monthly UN Comtrade data (United Nations Statistics Division, 2015) from January 2012 until June 2015 between all 37 sanctioning countries, Russia, and the 40 other largest exporters in the world. We exclude export flows of certain HS codes for which trade takes place only very infrequently and then in very large values. The respective HS codes are heading 8401 (“Nuclear reactors and part thereof”) and chapter 88 (“Aircrafts, spacecrafts, and parts thereof”). Although the sales of these products are also very likely to be impacted by the political tensions, these transactions are usually one-off events resulting in enormous spikes of total export and import values in some months and zero flows in all other months. We also exclude those products that were marked by the European Union as “energy-related

²⁸Hufbauer et al. (2009) employ what Head and Mayer (2014) coin a *naive* gravity setup.

equipment” and are subject to prior export authorization: HS headings 7304, 7305, 7306, 8207, 8413, 8430, 8431, 8705 and 8905. Furthermore, as trade with military and dual-use goods is banned by the EU and other sanctioning countries, we exclude chapter 93 (“Arms & Ammunition, parts & accessories”) and all HS codes that are masked the 4-digit level, i.e., those codes that are not shown for reasons of confidentiality. Finally, we aggregate to embargoed and non-embargoed product-level and are left with a total of 335451 non-zero observations. We provide the list of countries and descriptive statistics in table B.1 in appendix B.1.

2.3.1 Theoretical Framework

To analyze the impact of the imposed sanctions coherently on country and firm level, we now sketch a simple model that yields consistent estimatable equations for both levels. Consider a category of a good k where producers offer differentiated varieties. Demand in country d is governed by a constant elasticity of substitution sub-utility function over the set Γ_d of all varieties available in d , such that

$$U_{dkt} = \left(\int_{i \in \Gamma_d} [a_{idkt} q_{idkt}]^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}}. \quad (2.1)$$

In equation 2.1, subscript i denotes the firm, d the destination country, k the product, and t time. The elasticity of substitution is $\sigma > 1$, q_{idkt} is the quantity of the variety produced by i consumed in country d at time t , and a_{idkt} is a demand shifter. It captures the quality of a variety i as perceived by consumers in country d , but also the firm’s network of connections with purchasers in market d . The demand in market d , perceived by a given firm i , is

$$x_{idkt} = [p_{ikt}/a_{idkt}]^{1-\sigma} A_{dkt} T_{odkt}^{1-\sigma}. \quad (2.2)$$

A_{dkt} is a term in which we collect all the characteristics of destination d that promote imports of product k from all countries, i.e., total expenditure

on product k and multilateral resistance. The term p_{ikt} is the *fob* price charged by firm i at time t . Each firm i is located in a country o so that τ_{odkt} is the ad-valorem trade cost between origin country o and destination country d . Assuming that firms incur a fixed costs to enter each foreign market, they decide to export if the export revenue is greater than a given threshold, F_{dkt}

$$P(\Lambda_{idkt} = 1) = P[x_{idkt} > F_{dkt}]. \quad (2.3)$$

where Λ_{idkt} a dummy set to one if firm i exports product k to country d at time t . With CES preferences and ad-valorem trade frictions, the *fob* price is a constant markup over a firm's marginal cost. We write $1/a_{idkt} = \psi_{idk} e^{\epsilon_{idkt}}$, where ψ_{idk} is an index of all time-invariant non-price determinants of firms' competitiveness on market d and ϵ_{idkt} is white noise. Finally, sanctions, noted S_{odt} , affect trade through changes in the trade costs: $\tau_{odkt} = \bar{\tau}_{odk} e^{\delta S_{odt}}$. Plugging all these elements into equation 2.2, we obtain firm exports:

$$x_{idkt} = [p_{ikt} \psi_{idk} e^{\epsilon_{idkt}}]^{1-\sigma} A_{dkt} [\bar{\tau}_{odk} e^{\delta S_{odt}}]^{1-\sigma}. \quad (2.4)$$

Summing all exports from a given origin country, we obtain the country-level bilateral exports of product k :

$$X_{odkt} = \sum_{i \in o} x_{idkt} = N_{okt} A_{dkt} [\bar{\psi}_{odk} \bar{\tau}_{odk} e^{\delta S_{odt}}]^{1-\sigma} e^{\epsilon_{odkt}}. \quad (2.5)$$

N_{okt} subsumes all exporter \times product \times time specific effects of firms from country o producing k at time t , hence the number of firms, their total production and overall production and distribution networks, i.e. the country's multilateral resistance. $\bar{\psi}_{odk}$ is the aggregate of various determinants of competitiveness of firms from country o in country d , and ϵ_{odkt} is a structural error term.

2.3.2 Country-level Impacts of the Sanctions

Equation (2.5) has the familiar look of a gravity equation. Log-linearizing, the country-level impact of sanctions can be estimated as

$$\ln X_{odkt} = \Psi_{okt} + \Theta_{dkt} + \phi_{odk} + \beta S_{odt} + \epsilon_{odkt},$$

where Ψ_{okt} , Θ_{dkt} and ϕ_{odk} are fixed effects capturing all exporter \times product \times time, importer \times product \times time, and exporter \times importer \times product characteristics. In order to control for bilateral seasonal variations, very present in monthly trade data, we depart slightly from the structural model. We allow the bilateral product-level trade costs to vary by calendar month and include an exporter \times importer \times month fixed effect and estimate

$$\ln X_{odkt} = \Psi_{okt} + \Theta_{dkt} + \phi_{odkm} + \beta S_{odt} + \epsilon_{odkt}. \quad (2.6)$$

The coefficient of interest, β , is therefore estimated on the variation within country-pair-month. It is the elasticity of trade to sanctions, i.e., the average *partial equilibrium impact* of sanctions on exports. In this setup the exporter and importer fixed effects control for all domestic effects, such as economic output or volatile exchange rates, in both exporting and importing countries. The effect of sanctions is therefore measured against trade flows of non-sanctioning countries, holding the importer and exporter-specific fixed effects Ψ_{okt} and Θ_{dkt} constant. This disregards any general equilibrium effects, primarily on the Russian economy, but also on every other country. The decrease in exports to the Russian Federation from Western countries has changed its composition of imports, possibly leading to increased imports from other places (trade diversion) and overall more costly input sourcing (change in multilateral resistance). An analogous effect occurs on the part of the sanctioning countries, shifting their exports to other markets and making sales overall more difficult. These first-order effect would have second-order effects on other non-involved countries. Furthermore, the sanctions regime is likely to have had an impact on

overall production and expenditure. As the partial equilibrium effects potentially tell only part of the story, we will take a closer look at possible general equilibrium effects in section 2.3.3.²⁹

The vector of sanctions dummies is constructed as follows. The three distinct periods with respect to the implementation of sanctions described in section 2.2 are accounted for separately: a first period from December 2013 until February 2014, in which political tensions were increasing while no sanctions were put in place yet. A second period starts in March 2014 with the implementation of the so-called “first wave” of sanctions, later succeeded by the “second wave”, and ending in July 2014. During this period Western governments targeted people and institutions implicated in the events in eastern Ukraine and Crimea, a policy dubbed “smart sanctions”. Finally, a third period started in August 2014 with the implementation of harsher trade and financial sanctions, first by the EU and allied countries and then in retaliation by the Russian Federation. Each of the periods enters as a separate dummy into the regression of equation (2.6), i.e. is set to 1 during the respective time period and for implicated country pairs and 0 otherwise. Of course the estimated coefficients may pick up other events that may have altered trade flows between sanctioning countries and Russia during the treatment period. However, our use of monthly data and exporter \times date and importer \times date fixed effects alleviates the risk over omitted variable biases.

Table 2.1 displays the results of regressing equation (2.6) with an OLS estimator. Note that the coefficients from this unweighted OLS estimation can be interpreted as the average partial effect of the sanctions vis-a-vis the countries’ trade in the respective month “in normal times.” Standard errors are clustered at the country-pair-month level. Column (1) reports

²⁹As Dreger et al. (2015) point out, however, the main driver of the deterioration of the Ruble is due to the collapse of the crude oil price and not due to the trade sanctions. This suggests that the estimated partial equilibrium effects may come close to the general equilibrium effects, as will also be seen below.

	Dependent variable:		
	log(exports)		
	(1)	(2)	(3)
Dec '13–Feb '14	–0.029 (0.133)	0.127 (0.154)	–0.127 (0.132)
Mar '14–Jul '14	–0.099 (0.075)	–0.014 (0.128)	–0.158 ^c (0.086)
since Aug '14	–0.322 ^a (0.055)	–2.281 ^a (0.149)	–0.138 ^b (0.056)
Type of product	total	embargoed	non-embargoed
Observations	257,072	173,519	255,452
R ²	0.951	0.926	0.950
Adjusted R ²	0.932	0.891	0.930
Residual Std.	0.818	0.890	0.845
Error	(df = 184710)	(df = 117744)	(df = 183380)

Notes: All regression include exporter \times date, importer \times date and exporter \times importer \times month fixed effects. Robust standard errors in parentheses are clustered by exporter \times importer \times month. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table 2.1: Effect on value of trade with Russia by type of product and period

the coefficients for total flows. The first two period from December 2013 to July 2014 saw no significant decline in aggregate exports from sanctioning countries to the Russian Federation. Only with the beginning of the implementation of economic sanctions in August 2014 exports decreased significantly by about 27.5%, i.e., $1 - \exp(-0.322)$, on average. Column (2) reports the exports of the embargoed products that were targeted by Russian counter-sanctions, i.e., mostly agricultural and food productions described above. No significant change in exports was seen until the implementation of these import bans, which then, unsurprisingly, hit hard: Exports of embargoed products by Western countries to Russia decreased by 89.8% on average. Column (3) reports the coefficients for those products that were not directly targeted by either Western or Russian trade sanctions, but were exposed to the worsening political climate and financial sanctions. While exports did not decrease significantly during the period from December 2013 to February 2014, both the period of smart

	Dependent variable:		
	log(exports)		
	(1)	(2)	(3)
Non-EU x Dec '13–Feb '14	0.170 (0.249)	0.594 ^b (0.279)	0.001 (0.249)
x Mar '14–Jul '14	0.065 (0.119)	0.049 (0.209)	0.006 (0.130)
x since Aug '14	−0.432 ^a (0.118)	−2.513 ^a (0.402)	−0.087 (0.104)
EU x Dec '13–Feb '14	−0.102 (0.135)	−0.025 (0.153)	−0.174 (0.136)
x Mar '14–Jul '14	−0.148 ^b (0.074)	−0.030 (0.129)	−0.207 ^b (0.085)
x since Aug '14	−0.286 ^a (0.050)	−2.227 ^a (0.141)	−0.153 ^a (0.053)
France x Dec '13–Feb '14	−0.069 (0.136)	0.067 (0.141)	−0.143 (0.134)
x Mar '14–Jul '14	−0.231 ^c (0.118)	−0.046 (0.150)	−0.302 ^a (0.113)
x since Aug '14	−0.310 ^a (0.093)	−1.708 ^a (0.125)	−0.232 ^b (0.095)
Type of product	total	embargoed	non-embargoed
Observations	257,072	173,519	255,452
R ²	0.951	0.926	0.950
Adjusted R ²	0.932	0.891	0.930
Residual Std. Error	0.818	0.890	0.845
	(df = 184704)	(df = 117738)	(df = 183374)

Notes: All regression include exporter × date, importer × date and exporter × importer × month fixed effects. Robust standard errors in parentheses are clustered by exporter × importer × month. Significance levels: ^c: p<0.1, ^b: p<0.05, ^a: p<0.01.

Table 2.2: Effect on value of trade with Russia by type of product and period

sanctions from March 2014 to July 2014 as well as the time after August 2014 saw a significant decrease in exports from Western countries to the Russian Federation by averages of 14.6% and 12.9% respectively.

In table 2.2, we disentangle the impact by groups of countries. The impact on non-EU and EU countries could differ, due to the intensity of pre-conflict trade ties as well as the different composition of flows. We additionally single out France in order to receive comparable estimates for the firm-level analysis in section 2.4. The table is organized as before: Column (1) displays the coefficients on total exports, while columns (2) and (3) show those for the exports of embargoed and non-embargoed flows. Exports of non-EU sanctioning countries, i.e., the United States, Canada, Japan and others, experienced a significant decrease only in the period since August 2014. While total flows have decreased by on average 35%, this is almost entirely driven by the 91.9% plunge in exports of embargoed products. These results differ from those of sanctioning EU countries and France in particular. This is not surprising, as through Europe's proximity, Russia constitutes a major trading partner, especially for central and eastern European countries. Between March and July 2014 total exports of EU countries (excluding France) dropped by an average of 13.8% (France 20.6%) and 24.9% (France 26.7%) since August 2014. While French exports of embargoed products since the imposition of economic sanctions in August 2014 decreased by less than EU average (EU 89.2% and France 81.9%), those of non-embargoed products were hit relatively harder (EU 14.2% and France 20.7%).

The results suggest that the trade sanctions put in place by the Russian Federation in August 2014 wiped out most of the exports of those goods that were targeted, while the overall sanctions regime also took a toll on non-embargoed exports. In fact, as seen above, the decrease in exports of non-embargoed products appears to be the main driver of the overall decline. In section 2.4 we will test these results against more detailed firm-level data and disentangle possible channels that explain this "collateral damage."

2.3.3 Quantification of Lost Trade

To put the results from above in perspective, we now quantify the cost in terms of “lost trade.” Using the gravity setup from above, we predict trade flows to Russia from sanctioning countries and calculate the difference to observed flows. This allows us to put a price tag on the use of sanctions employed by both sides. The partial equilibrium estimates from above, however, might conceal important feedback effects. The changes in trade impediments due to the conflict and sanctions also impacted the multilateral resistance terms. Additionally, the sudden increase in bilateral trade costs between sanctioning countries and Russia likely had a sizable impact on production and expenditure in Russia and, to a probably lesser degree, in sanctioning countries. The methodology we employ is comparable to Glick and Taylor (2010)’s, who examine the effect of the two world wars in a gravity setup and compute a counterfactual by modifying the multilateral resistance terms accordingly. In contrast to their work, however, we also explicitly take changes in production and expenditure figures into account, building on an approach initially pioneered by Dekle et al. (2007).

Returning to equation (2.5) and abstracting from the product dimension k , assume that the importer and exporter-specific terms N_{ot} and A_{dt} were to have an Armington-type structure as in Head and Mayer (2014), such that

$$N_{ot} = \frac{Y_{ot}}{\Omega_{ot}} \quad \text{and} \quad A_{dt} = \frac{X_{dt}}{\Phi_{dt}},$$

where $Y_{ot} = \sum_d X_{odt}$ is the value of production, i.e. all exports, in o at time t , $X_{dt} = \sum_o X_{odt}$ is the value of expenditure, i.e. all imports, in d time t . Ω_{ot} and Φ_{dt} are the respective multilateral resistance terms, such that

$$\Omega_{ot} = \sum_{l \in d} \frac{X_{lt}}{\Phi_{lt}} \cdot \phi_{olm} \cdot e^{\beta S_{olt}} \quad \text{and} \quad \Phi_{dt} = \sum_{l \in o} \frac{Y_{lt}}{\Omega_{lt}} \cdot \phi_{ldm} \cdot e^{\beta S_{ldt}}.$$

Plugging these into equation (2.5) then yields a structural gravity equation

where bilateral exports X_{odt} between countries o and d at time t are governed by

$$X_{odt} = \frac{Y_{ot}}{\Omega_{ot}} \cdot \frac{X_{dt}}{\Phi_{dt}} \cdot \phi_{odm} \cdot e^{\beta S_{odt}} \cdot e^{\epsilon_{odkt}}, \quad (2.7)$$

where $\phi_{odm} = [\bar{\psi}_{odm} \bar{\tau}_{odm}]^{1-\sigma}$, subsuming all seasonally-varying bilateral trade barriers and facilitators. This setup allows us to compute counterfactual multilateral resistance terms and the corresponding trade flows by setting all $S = 0$, i.e., “switching off” sanctions. As Anderson and Yotov (2010) and Head and Mayer (2014) note, this does not entail a full general equilibrium analysis as production and expenditure terms are unaffected. In order to account for explicit changes to countries’ production and expenditure, we make use of a simple counterfactual general equilibrium framework that is similar to Dekle et al. (2007, 2008) and Anderson et al. (2015), with the added feature that it does not rely on any additional data next to observed trade flows.

Partial, Modular and General Equilibrium Effects

We re-estimate equation (2.6) *without* “treated observations,” i.e., those directly affected by the sanctions, allowing us to predict partial equilibrium trade flows without imposing a homogeneous impact on certain groups of countries or time periods. This effectively permits the elasticity to vary by country and time so that β_{odt} . The estimated bilateral fixed effect $\hat{\phi}_{odm}$ captures bilateral monthly trade costs for “normal times,” as the period and country pairs that are directly affected by sanctions are excluded. The importer and exporter fixed effects $\hat{\Psi}_{ot}$ and $\hat{\Theta}_{dt}$ are capturing everything country-specific at the respective time. This means that those fixed effects for the time during the sanctions period are also capturing sanctions-induced changes in multilateral resistance terms, production and expenditure figures.³⁰ Using these estimated fixed effects then, the

³⁰The estimated fixed effects are relative to one reference country and one bilateral country-pair-month, for which either $\hat{\Psi}_{ot}$ or $\hat{\Theta}_{dt}$ is zero at all dates and one $\hat{\phi}_{odm} = 0$.

predicted *partial equilibrium* flows can be constructed simply as

$$\hat{X}_{odt} = \exp\left(\hat{\Psi}_{ot} + \hat{\Theta}_{dt} + \hat{\phi}_{odm}\right).$$

Crucial for the *general equilibrium* analysis to follow, any hypothetical (pseudo-) production and (pseudo-) expenditure figures can be backed out of the estimated fixed effects as³¹

$$\begin{aligned} \hat{Y}_{ot} &= \sum_{l \in d} \exp\left(\hat{\Psi}_{ot} + \hat{\Theta}_{lt} + \hat{\phi}_{olm} + \hat{\beta}_{olt} S_{olt}\right) \quad \text{and analogously} \\ \hat{X}_{dt} &= \sum_{l \in o} \exp\left(\hat{\Psi}_{lt} + \hat{\Theta}_{dt} + \hat{\phi}_{ldm} + \hat{\beta}_{ldt} S_{ldt}\right), \end{aligned} \quad (2.8)$$

while inward and outward multilateral resistance terms can be constructed as

$$\begin{aligned} \hat{\Omega}_{ot} &= \sum_{l \in d} \exp\left(\hat{\Theta}_{lt} + \hat{\phi}_{olm} + \hat{\beta}_{olt} S_{olt}\right) \quad \text{and} \\ \hat{\Phi}_{dt} &= \sum_{l \in o} \exp\left(\hat{\Psi}_{lt} + \hat{\phi}_{ldm} + \hat{\beta}_{ldt} S_{ldt}\right). \end{aligned} \quad (2.9)$$

$\hat{\beta}_{odt} S_{odt}$ is simply the difference between \hat{X}_{odt} and X_{odt} for “treated observations,” i.e., those that involve the Russian Federation and a sanctioning country. Counterfactual trade flows can then be computed as

$$\hat{X}_{odt} = \frac{\hat{Y}_{ot}}{\hat{\Omega}_{ot}} \cdot \frac{\hat{X}_{dt}}{\hat{\Phi}_{dt}} \cdot \hat{\phi}_{odm} \cdot e^{\hat{\beta}_{odt} S_{odt}}, \quad (2.10)$$

for any respective setting of S . As noted by Anderson and Yotov (2010), $\Omega \cdot \lambda$ and $\Phi \cdot \lambda^{-1}$ are unique for any λ , given a set of production figures Y , expenditure figures X and trade costs ϕ . The *modular trade impact*, the change in trade flows due to the sanctions-induced change in multilateral resistance terms, can therefore be determined by recomputing the multi-

The choice of these references has no impact on the computations, however they have to remain the same in all following estimations.

³¹We refer to the figures as pseudo-figures, as they only represent the production and expenditures for countries present in the data. This departure from Anderson et al. (2015), who convert them into actual production figures with additional data, however, does not impact the results as all later general equilibrium adjustments to the figures enter in multiplicative form.

lateral resistance terms accordingly. This is easily done via a contraction mapping algorithm, i.e. iteratively solving the following system of matrix equations:

$$\begin{aligned}\hat{\Omega}_t &= \hat{\phi}_m (\hat{X}_t \otimes \hat{\Phi}_t^{-1}) \\ \hat{\Phi}_t &= \hat{\phi}_m^T (\hat{Y}_t \otimes \hat{\Omega}_t^{-1}),\end{aligned}\quad (2.11)$$

where $\hat{\Omega}_t$ and $\hat{\Phi}_t$ are vectors of outward and inward multilateral resistances³² at time t and $\hat{\phi}_m$ the trade cost matrix for month m .³³

This modular effect, however, still omits changes in the production and expenditures of exporters and importers due to the sanctions. Anderson et al. (2015) propose an adjustment of *factory-gate prices* to production and expenditures, such that

$$\hat{Y}_{ot} = \hat{Y}_{ot}^{\text{partial}} \cdot \left(\frac{\hat{\Omega}_{ot}}{\hat{\Omega}_{ot}^{\text{partial}}} \right)^{\frac{1}{1-\sigma}} \quad \text{and} \quad \hat{X}_{dt} = \hat{X}_{dt}^{\text{partial}} \cdot \left(\frac{\hat{\Omega}_{dt}}{\hat{\Omega}_{dt}^{\text{partial}}} \right)^{\frac{1}{1-\sigma}}, \quad (2.12)$$

where σ is the elasticity of substitution and $\hat{Y}_{ot}^{\text{partial}}$ and $\hat{X}_{dt}^{\text{partial}}$ and production and expenditure figures constructed using equation (2.8) and estimated fixed effects from the initial partial equilibrium estimation. $\hat{\Omega}_{ot}^{\text{partial}}$ is the constructed outward multilateral resistance term from that same partial equilibrium estimation, while $\hat{\Omega}_{ot}$ is the currently estimated outward multilateral resistance term, in this case using trade flows incorporating the modular effect. The term “factory-gate price” should be understood as an aggregate, country-wide measure, as it implicitly incorporates not only effects on the intensive margin, as expressed through equation (2.4), but also the extensive margin, as in equation (2.3), at the individual firm level.

³² $\hat{\Phi}_t^{-1}$ and $\hat{\Omega}_t^{-1}$ are vectors of elementwise inverses of $\hat{\Omega}_t$ and $\hat{\Phi}_t$, and \otimes denotes the elementwise product.

³³Alternatively, Anderson et al. (2015) show that the PPML estimator yields correct multilateral resistance terms with observed trade flows and counterfactual trade costs. This is due to the property described by Fally (2015), where estimated production and expenditure figures remain equal to observed figures with the PPML estimator. Computationally, however, solving iteratively the system of matrices is far less demanding.

Combining these adjusted production and expenditure figures with the computed multilateral resistances terms, equation (2.10) yields the counterfactual flows between all countries incorporating *first-order* changes. The counterfactual *general equilibrium* flows can then be inferred from iteratively recomputing production, expenditures, multilateral resistance terms and counterfactual trade flows accordingly using equations (2.8), (2.12), (2.11), and (2.10) until \hat{X}_{odt} converge.

Estimated General Equilibrium Impact

The estimations of the lost trade for each sanctioning country and product are shown in tables B.5, B.6, and B.7 in the appendix.³⁴ Figures 2.2 and 2.3 show the results of performing the counterfactual analysis with total exports and those of embargoed products to Russia by all sanctioning and non-sanctioning countries. The solid line displays the observed value and the dashed one the predicted value using the procedure detailed above. The three vertical lines indicate the three dates at which the previously defined periods start: December 2013 for the beginning of the conflict, March 2014 for the first implementation of “smart sanctions” and August 2014 for the beginning of economic sanctions from both sides. The fit is remarkably good in the pre-conflict time between later treated country pairs and between untreated country pairs, suggesting precisely estimated fixed effects and general validity for the results. The importer \times time fixed effects for the Russian Federation in particular appear to capture well the overall turmoil in the Russian economy, as the observed drastic drop of imports from *non-sanctioning* countries in early 2015 is almost perfectly mirrored by a predicted drop. We will use the estimated importer \times time fixed effects later in section 2.4 to control for importer-specific shocks.

³⁴Table B.4 in the appendix shows the average monthly lost trade in 2014 by step in the procedure detailed above, i.e. by partial equilibrium effect, modular impact and general equilibrium effect.

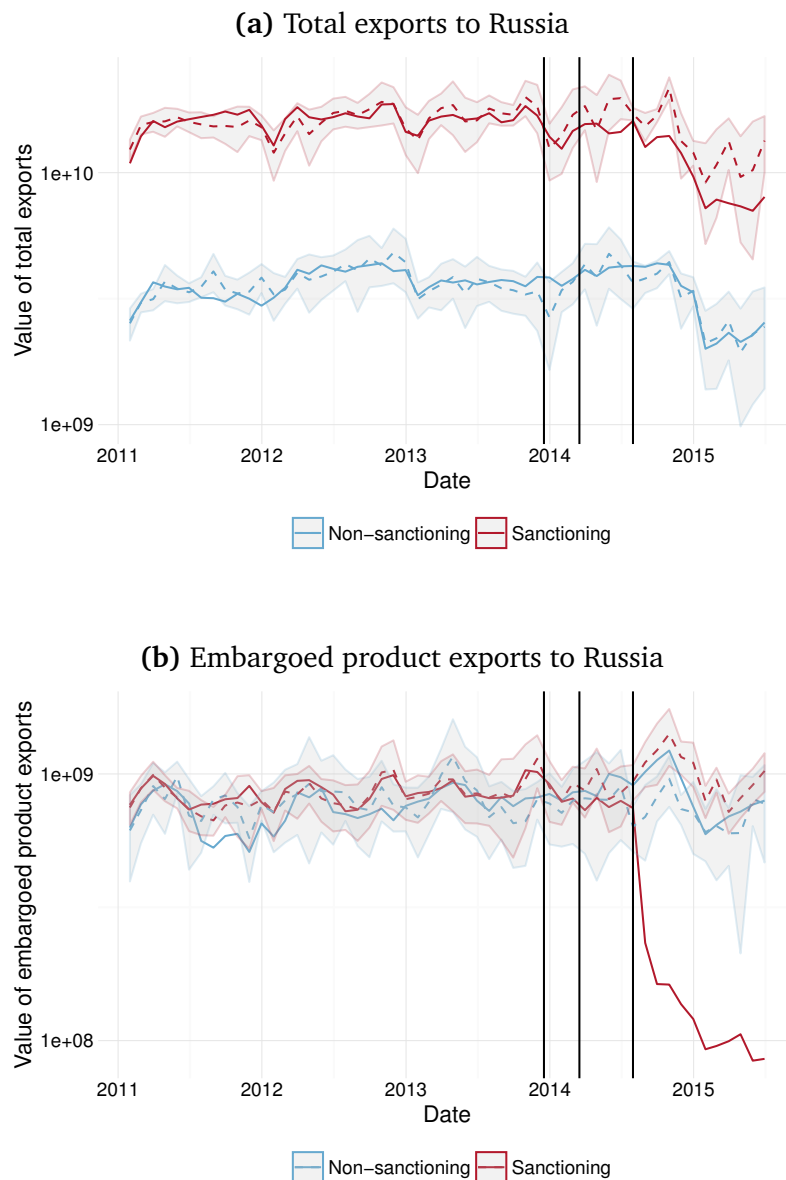


Figure 2.2: Predicted vs. observed total value of exported goods to Russia from sanctioning and non-sanctioning countries by type of products. Solid lines display observed trade flows, dashed lines predicted flows. Vertical lines indicate dates of interest. 95% confidence intervals based on bootstrapped standard errors.

As seen in figures 2.2a and 2.2b, the predicted values match the observed values very closely for the time prior to the initial beginning of political tensions in December 2013. This changes afterwards. While the observed

flows from non-sanctioning countries remain close their predicted values, those of the sanctioning countries deviate. Total trade of those countries moves away from its prediction starting in January 2014 and sharply so since the beginning of economic sanctions in August 2014. The pattern is dramatically visible for embargoed products, where the exports of sanctioning countries collapses starting in August 2014.³⁵

The picture is reinforced when zooming into two-country comparisons and performing (pseudo) placebo tests on non-treated importers and exporters. Figure 2.3a displays the total value of embargoed product exports to Russia from Germany and Switzerland—a non-treated exporter. The two countries are highly similar: both are located at similar distances to the Russian Federation, speak the same language and belong to the same free trade zone. However, only Germany is “treated”, as described in section 2.2. Exports from Germany decreased significantly after the beginning of the conflict and collapsed after the imposition of economic sanctions in August 2014, while those of neutral Switzerland remained virtually unchanged. In figure 2.3b, we conduct another placebo test by looking at exports of embargoed products by Germany to Russia and Turkey—a non-treated importer. Again there is virtually no difference between observed and predicted trade flows to Turkey when artificially treating these as sanctioned. The results of these placebo tests clearly indicate the particularity of bilateral trade flows between sanctioning countries and Russia since the beginning of the conflict and further support the validity and quality of the predictions using the estimated fixed effects.

To get a better idea of the magnitude of the impact, we compute the difference between predicted and observed trade flows by country. This difference amounts to the “lost trade” between sanctioning countries and Russia. The global figure for the period we cover here, from December

³⁵See appendix B.4, tables B.5, B.6 and B.7 for the quantification of lost trade with total, embargoed and non-embargoed goods trade by period and country.

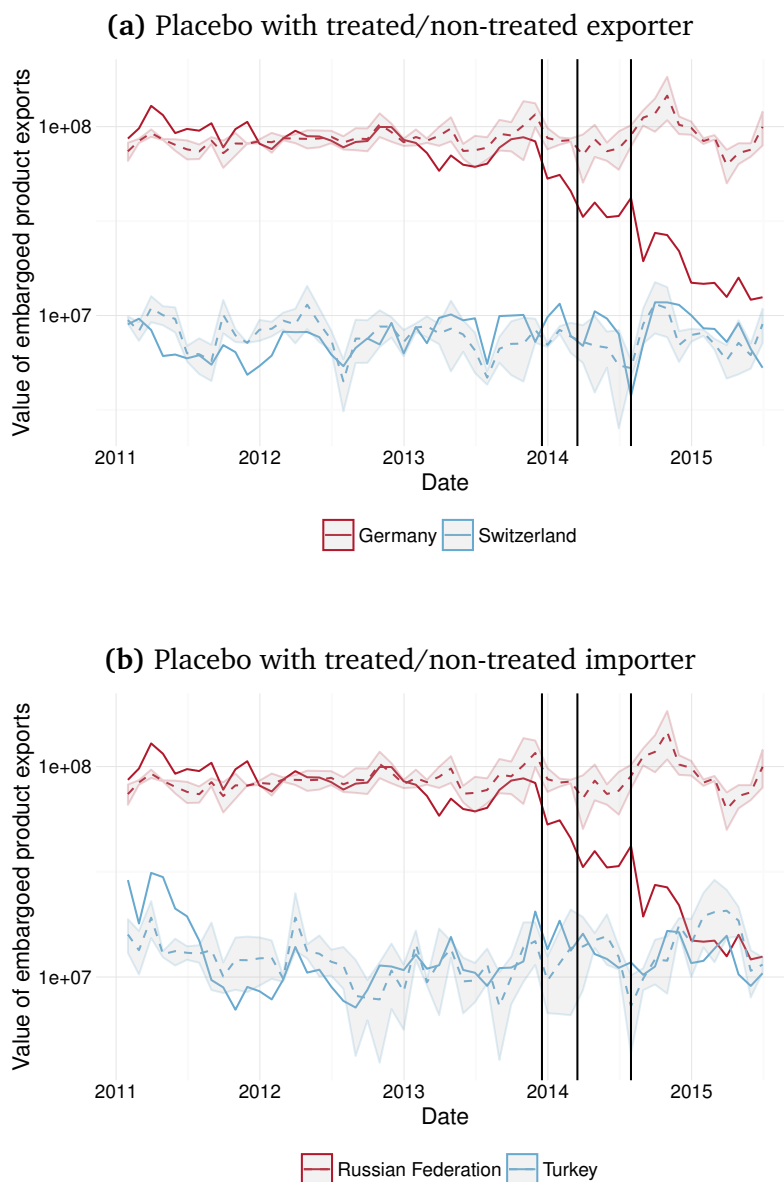


Figure 2.3: (Pseudo) placebo test with treated/non-treated exporter and importers. Solid lines display observed trade flows, dashed lines predicted flows. Vertical lines indicate dates of interest. 95% confidence intervals based on bootstrapped standard errors.

2013 to June 2015, totals US\$ 60.2 billion, US\$ 10.7 billion (or 17.8%) of which in embargoed products and US\$ 49.5 billion (or 82.2%) in non-embargoed products. Of this lost trade in embargoed products, unsurprisingly, 94.4% was incurred after the imposition of trade sanctions.

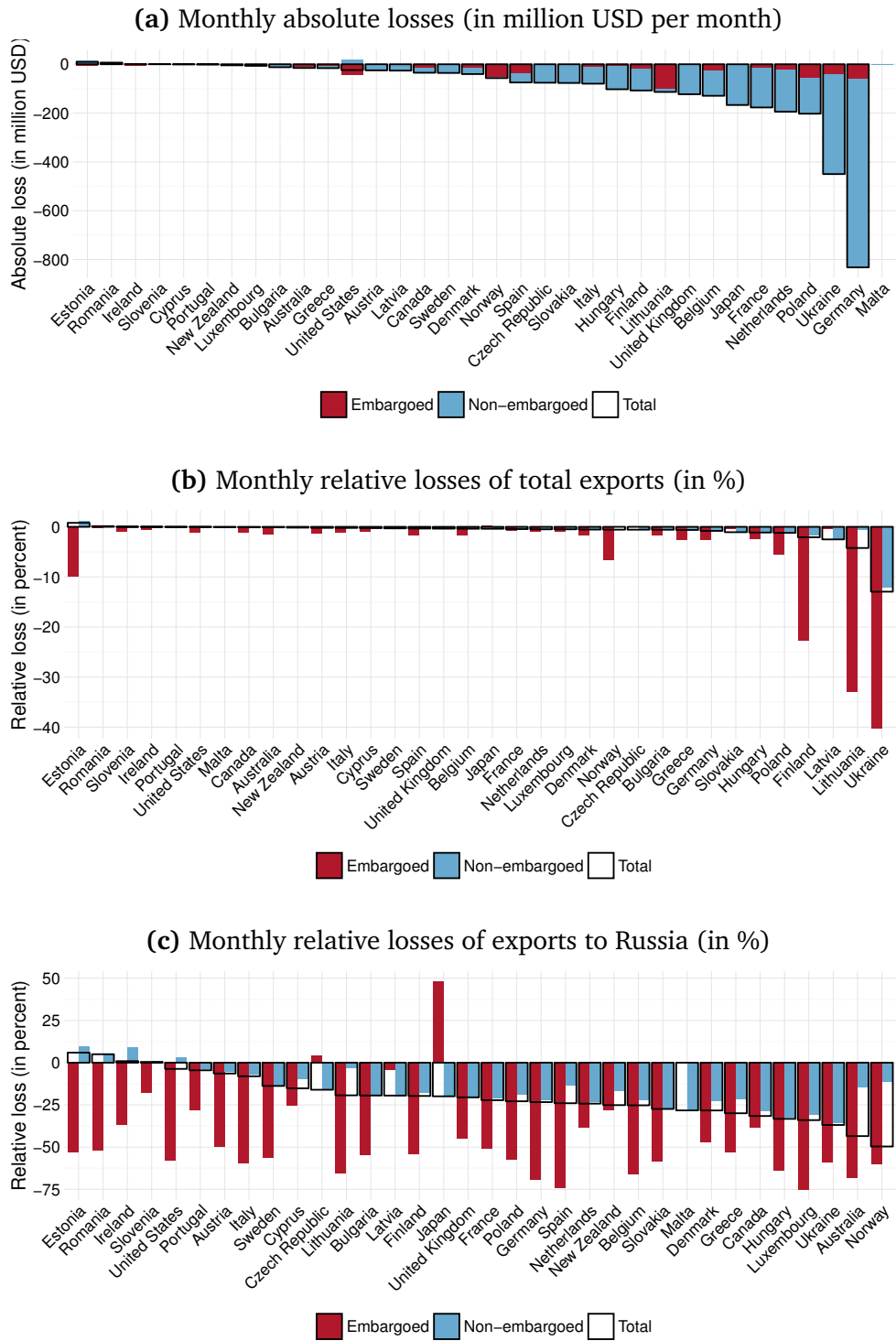


Figure 2.4: Composition lost trade of embargoed/non-embargoed products by country

The bulk of the “lost trade” (83.1%) can therefore be considered *collateral damage*, a cost on private actors that were not directly targeted by the Russian embargo.³⁶

This *collateral damage*, however, is not evenly distributed among countries: Figure 2.4 displays the average monthly difference between predicted and observed exports—the “lost trade”—in absolute terms (figure 2.4a), relative to the country’s total exports (figure 2.4b) and to its exports to Russia (figure 2.4c) for each sanctioning country, broken down into trade of embargoed and non-embargoed products. The European Union bears 76.7% of all lost trade and 78.1% of lost trade in non-embargoed products. In relative terms, countries that had strong trade ties with Russia in the pre-sanction period are hit hardest: Ukraine (-12.9%; US\$-449 million), Lithuania (-4.2%; US\$-113 million) and Latvia (-2.5%; US\$-26 million) are most affected in terms of their relative loss in total exports. Norway and Australia are most impacted in terms of relative losses in exports to Russia, with lost trade amounting to up to 45% of predicted flows. These countries, however, incurred most of their losses from lost trade in embargoed products, i.e. were directly affected by the measures put in place by the Russian Federation. Germany is losing the most exports in absolute terms, more than US\$832 million per month on average (-0.8% of total exports), most of it incurred by non-embargoed products. Ukraine, the Netherlands (US\$-194 million; -0.5% of total exports) and Poland (US\$-202 million; -1.2% of total exports) follow, albeit in much smaller values.

In percentage terms, Germany is bearing 27% of the global lost trade, while other major geopolitical players like the United States (0.4%; -0.02% of total exports), France (5.6%; -0.5% of total exports) and the United Kingdom (4.1%; -0.4% of total exports) incurred much less. Unsurprisingly,

³⁶Embargoed products are likely additionally exposed to the same factors that induced the decrease in exports of non-embargoed products, so that this number of “collateral damage” can be considered a lower-limit estimate.

Ukraine is losing massively in both absolute and relative terms, as the Russian Federation used to be its main trading partner. Overall, the composition of the losses incurred varies widely by period and affected products.

2.4 Drilling Down: Firm-level Impacts

We now explore more closely how firms reacted to the sanctions. By inspecting the response of exporters to the sanctions, we aim to shed light on the underlying mechanisms that gave rise to the export losses identified in the previous section. More precisely, the aim of this investigation is twofold. First, we want to estimate the impact of the sanction on the trade margins, in order to determine to what extent the sanctions lead exporters from sanctioning countries to leave the Russian market or just to reduce the volume or the price of their shipments. This distinction is key to gauge the long term consequences of the sanctions and speed at which trade can recover after they are lifted. Second, we aim to provide indirect evidence about the exact nature of the trade impediments generated by the sanctions by looking at the heterogeneity of firms' responses depending on their own characteristics or the type of product they export.

To conduct these analyses, we focus on the case of France, for which we have detailed customs data providing monthly exports and imports at the firm-product-destination level. As mentioned above, the Russian Federation is a major trade partner for France. In 2013, it was the 12th most important destination for French exports, and the 5th one outside the European Union, after the United States, China, Switzerland and Japan. Russia was also the 15th major destination of French exports of food and agricultural products, and the 6th one outside the EU.

2.4.1 Empirical Specification

The econometric analysis is a difference-in-differences approach, based on the simple and very general trade model described above. Log-linearization of equation 2.2 gives:

$$\ln x_{idkt} = (1 - \sigma) \ln[p_{ikt}\psi_{idk}] + \ln A_{dkt} + (1 - \sigma) \ln[\bar{\tau}_{odk}e^{\delta S_{odt}}] + \epsilon_{idkt},$$

or equivalently:

$$\ln x_{idkt} = \theta_{itk} + \theta_{idk} + \theta_{dkt} + \beta S_{odt} + \epsilon_{idkt}, \quad (2.13)$$

where θ_{idk} is a firm \times product \times destination fixed effect capturing $\ln \psi_{idk}$ and $\ln \bar{\tau}_{dk}$. We capture $\ln p_{ikt}$ by a firm \times product \times time fixed effect, θ_{itk} . As in equation 2.6, θ_{dkt} is a destination \times product \times time fixed effect that captures $\ln A_{dkt}$. The ideal difference-in-differences analysis based on the equation above would compare the trend of exports of French firms to Russia to the ones of firms originating from a country not involved in the diplomatic conflict. This would require two sets of monthly firm-level records, which is not feasible in practice. Instead, our firm-level analysis exploits micro trade data from one single origin country. Therefore, the impact of the sanctions (β) cannot be estimated jointly with the time-varying destination fixed effect, θ_{dkt} . To circumvent this problem, we use the destination \times products \times time fixed effect estimated in the previous section ($\hat{\Theta}_{dkt}$ in equation 2.6) as a proxy for $\ln A_{dkt}$. This variable captures the characteristics of any destination d that promote imports from all countries and for all goods. It is important to notice that the econometric analysis of firm-level response to the sanction will be conducted with individual export data aggregated at the 4-digit level of the HS classification (HS4). Unfortunately, it is not computationally feasible to estimate the fixed effects $\hat{\Theta}_{dkt}$ for all HS4 products. We therefore simply use variables $\hat{\Theta}_{dk't}$ defined—as done in the previous section—for the aggregates (k') of embargoed and non-embargoed products. In order to compensate the fact that our proxy for $\ln A_{dkt}$ is more aggregated

than our dependent variable, we do not constraint the coefficient on $\hat{\Theta}_{dk't}$ to be equal to one. As before, the sanction variable S_{dt} is specific to trade with Russia and covers three distinct periods: From December 2013 to March 2014; From April 2014 to July 2014; and from August 2014 to December 2014. Finally, we estimate the following difference-in-differences specifications:

$$\ln x_{idkt} = \theta_{idk} + \theta_{itk} + \alpha \hat{\Theta}_{dk't} + \sum_{p=1,2,3} \delta_p \text{Event}_p \times (d = \text{Russia}) + \varepsilon_{idkt}, \quad (2.14)$$

and

$$P[\Lambda_{idkt} = 1] = P[\theta_{idk} + \theta_{itk} + \alpha' \hat{\Theta}_{dk't} + \sum_{p=1,2,3} \delta'_p \text{Event}_p \times (d = \text{Russia}) + \varepsilon'_{idkt} > \ln F_{dkt}]. \quad (2.15)$$

In equations 2.14 and 2.15, ε_{idkt} and ε'_{idkt} are the errors terms. The coefficients of interest, δ_p and δ'_p , are the average treatment effect for each period. They measure the impact of the conflict and sanctions regime on the trend of firms' exports to Russia.

2.4.2 Firm-level Data

We exploit a dataset of the universe of monthly French exports at the firm level, provided by the French customs authorities. Our data covers more than 10 years until December 2014. Each observation records date (year and month), a unique firm code (*SIREN*), 8-digit product code (*nc8*), the destination country, value (in Euros) and quantity exported. Over the four years between 2011 and 2014, 160,677 individual French firms traded some 10110 different products.

Our empirical specifications, defined with equations 2.14 and 2.15, compare the trend of exports of a given firm to Russia to its trend of exports to alternative destinations. In consequence, we restrict our sample to firms that export to Russia at least once between January 2012 and December 2014. This leaves us with 20.7 million observations and 10,498 exporters. In order to reduce the sample size further, we aggregate all trade flows at the 4-digit level (HS4), the level at which the Russian counter-sanctions apply. We exclude from the analysis the goods that are subjected to export restrictions within the framework of European sanctions (see table B.2) along with “Nuclear reactors and part thereof” (*HS 8401*) and “Aircrafts, spacecrafts, and parts thereof” (*HS 88*). All together, these products represented about 12% of French exports to Russia in 2012. However, the trade of these products is very granular. The exports are concentrated among a very small number of large companies³⁷ which export very large amounts, in a very sporadic way. This granularity makes a robust identification of a trend in export flows very difficult. Finally, our analysis focuses on all months of 2012–2014. The final database then contains 7,455 firms, covers 995 HS4 products and counts 22,619 firm-HS4 groups.

In order to be able to control for unobserved determinants of time-varying individual supply capacities (with the firm \times product \times date fixed effect, θ_{itk}), we need a control group consisting of alternative destinations of French exports. The difficulty is that export flows to any other country are potentially affected by the treatment. The limitations on trade with Russia can influence the exports towards other destinations in two different ways. On the one hand, French firms that had to cut exports to Russia because of the sanctions may have tried to compensate for their losses by expanding their sales to other countries. In this case, the measures would have boosted the French export to non-Russian markets, which were to lead us to overestimate the impact of the treatment on French exports towards Russia. On the other hand, the diversion of trade toward

³⁷In 2012, exporters of these products represent less than 2% of French firms exporting to Russia.

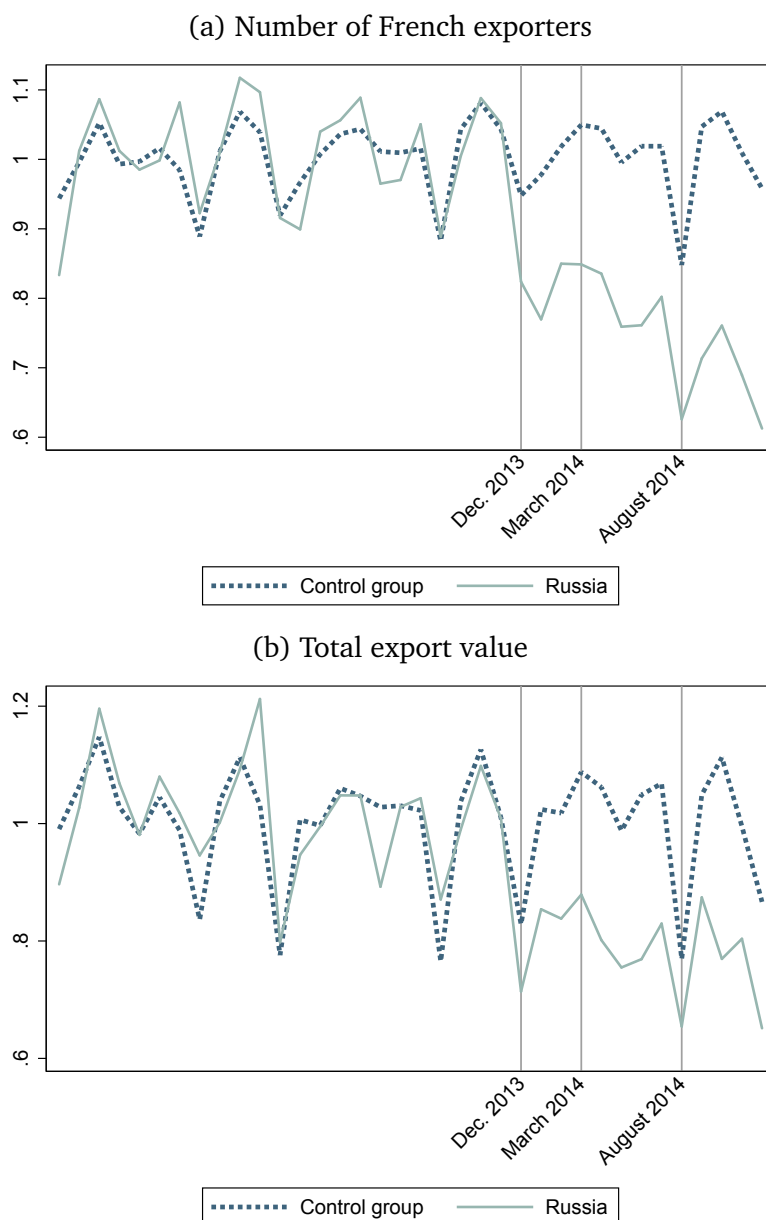


Figure 2.5: Trend in the number of French exporters and export value to Russia and control group countries

non-Russian markets should increase the toughness of these destinations in terms of competition and make them less accessible to French exporters. This effect would bias downward the estimated impact of sanctions. It seems reasonable, however, that firms that are directly affected by the trade restrictions divert their exports intended to Russia first and foremost towards their own domestic market. As a consequence, the second

bias is presumably stronger in countries involved in the sanctions regime. Therefore, our preferred control group is composed of sanctioning European countries in close proximity to Russia: Romania, Bulgaria, Greece, Finland, Norway, Sweden, Estonia, Latvia, Lithuania, Poland, Hungary, Czech Republic, Slovakia, Slovenia, and Croatia. Because all these countries actively sanctioned Russia, we expect French exports to this control group to be negatively affected by the sanctions, leading to a conservative lower bound estimate of the direct impact of sanctions on French exports towards Russia. Moreover, figure 2.5 is supportive of the choice of this control group by showing that French exports to these destinations are not greatly affected by the treatment. Panels (a) and (b) show the number of French exporters and total French exports to Russia and the control group, respectively, normalized by the average levels during the pre-event period (from December 2012 to November 2013). While there is a clear drop in the intensity of export relationships with the Russian Federation starting in December 2013, there is no visible change in the trend of exports toward control group countries.

Given the nature of the data (and the presence of a high proportion of zeros in the monthly reports of trade flows), it may seem natural to resort to non-linear methods to estimate equations 2.14 and 2.15. However, our empirical specification imposes two very large sets of fixed effects that may generate incidental parameters problems that would bias the non-linear estimates. For this reason, the estimations are carried out using linear estimators: Fixed effects OLS for equation 2.14 and linear probability model for 2.15. The error term in equation 2.2 (and consequently in 2.14 and 2.15) reflect unobserved idiosyncratic shocks in firm-product-destination-time demand shifters. Therefore, we cluster errors by firm-product to allow for possible correlation between disturbances of trade flows across destinations and over dates within an exporter. Naturally, we check the robustness of our results to alternative choices of estimators.

2.4.3 Impact on Trade Margins

In this section, we investigate the consequence of the escalation of sanctions between Russia and Western countries on French firms' exports.

Extensive Margin: Stopping to Export?

HS 4	(1) All	(2) Embargoed	(3) Non-embargoed
Russia \times Dec '13–Feb '14	-0.021 ^a (0.002)	-0.042 ^b (0.020)	-0.020 ^a (0.002)
Russia \times Mar '14–Jul '14	-0.025 ^a (0.002)	-0.096 ^a (0.021)	-0.023 ^a (0.002)
Russia \times Aug '14–Dec '14	-0.035 ^a (0.002)	-0.285 ^a (0.023)	-0.029 ^a (0.002)
$\hat{\Theta}_{dt}$	0.040 ^a (0.003)	0.067 ^a (0.025)	0.040 ^a (0.003)
Nb. Obs.	3436452	68724	3367728
R ²	0.595	0.636	0.594
<hr/>			
% change in predicted conditional probability of exporting to Russia			
Dec '13 - Feb '14	-8.2	-10.3	-8.1
Mar '14 - Jul '14	-9.4	-23.8	-8.9
Aug '14 - Dec '14	-14.1	-77.3	-11.8

Notes: All regression include Firm \times Destination \times HS4 and Firm \times time \times HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm \times HS4. Linear probability estimates. Dependent variable is a dummy set to one for positive exports. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table 2.3: Benchmark regressions: Export probability - LPM

We focus first on the extensive margin. The benchmark results for the impact of sanctions on export participation are shown in table 2.3. The table reports linear probability model (LPM) estimates of equation 2.15. Column (1) reports the results for all HS4 together, column (2) shows the estimates for products targeted by the Russian embargo and column (3) the ones for non-embargoed products. All regressions corroborate the fact, established in section 2.3, that the diplomatic dispute impacted negatively French exports to Russia. Results in table 2.3 show that the impact is par-

ticularly strong on the extensive trade margin. While the results obtained with aggregated trade flows failed to show a significant drop in French exports between December 2013 and February 2014 (cf. table 2.2), the firm-level regressions reveal a significant and sizable decline in export participation during each of the three periods of interest. The bottom part of the table reports the percentage difference between the estimated average probability of exporting to Russia in presence of the treatment and the one when the treatment dummy is set to zero. This difference measures the magnitude of the change in export probability resulting from the treatment. French exporters reacted strongly to the growing instability at the Russian border. On average for all products (column 1), the probability of exporting to Russia is reduced by 8.2% during the first period. The contraction of the export probability increased progressively in periods 2 and 3, with the implementation of the “smart sanctions” and later tougher economic sanctions. Compared to the benchmark level, the probability of exporting to Russia has been reduced by 9.4% during the time of Western “smart sanctions” (period 2) and by 14.1% during the last period. This means that most of the reduction of the propensity to export to Russia is attributable to the insecurity generated by the conflict at the Russian border. However, even if one assumes that the consequence of the conflict did not fade away during 2014,³⁸ the econometric results indicate that the sanctions had non-negligible repercussions on French exporters. For all products together, the Western “smart sanctions” reduced the probability of exporting by 1.2 percentage points and the economic sanctions by the West and Russian counter-sanctions by an additional 4.7 percentage points. Not surprisingly, the drop in export participation due to the uncertainty generated by the conflict in Ukraine is roughly the same for embargoed and non-embargoed products. However, the Russian embargo on agri-food products had a huge impact: After August 2014, the probability of exporting embargoed products was reduced by 77.3%.³⁹

³⁸Which is unlikely because the Minsk Protocol, signed in early September 2014, stopped the escalation of the violence to a certain degree and confined the war to the Eastern part of Ukraine. Moreover, the monthly estimates shown in figure 2.6 show that the export probability recovered partially after February 2014.

³⁹The impact is less than 100%, however, as the list of products that are banned by the

It is noteworthy that the strong reduction in the probability of exporting embargoed products began before the implementation of the embargo. In other words, if it is true that the embargo almost eliminated the exports of embargoed products, the political instability in the region and—even more—the “smart sanctions” imposed by Western countries also struck a blow at French exporters of these products.⁴⁰

Another interesting finding is that the drop in export participation increased between period 2 and period 3 for products that are not targeted by the Russian embargo (column 3), which indicates that the reinforcement of the EU sanctions in August 2014 increased the burden for French exporters. This is more visible in figure 2.6. Instead of considering three periods between December 2013 and December 2014, we now interact the dummy (destination = Russia) with 13 dummies for each of the months from December 2013. The figure reports the coefficients associated with these 13 treatment variables. We see the radical impact of the Russian embargo on targeted products. For non-embargoed products, we observe ups and downs. However, export participation drops suddenly every time the EU extended the sanctions, suggesting that the announcement of new restrictions generated institutional instability that disturbed business relationships.

Russian authorities does not overlap exactly the HS classification, baby food for instance is explicitly exempt. In other words, our definition of the embargoed products is quite comprehensive (and conservative) and covers some varieties of products for which the export to the Russian Federation is not prohibited.

⁴⁰This finding has important policy implications. France, as most European countries, faced a severe farming crisis in 2014–2015 and several political leaders blamed the Russian embargo for generating excess supply in the EU and depressing the agricultural goods prices. For instance, Xavier Beulin, the leader of the main French farmer union (FNSEA), in October 2014 wrote a public letter to the French president claiming that “the Russian Embargo generates, at least, a direct loss of 5.2 billion Euros per year.” Not to mention the evident overestimation of this figure (from 2011 to 2013 the total French exports of agricultural and agri-food products to Russia was less than 1,2 billion Euros per year), our estimations show that most of the drop in exports of embargoed goods to Russia in 2014 is not the consequence of the embargo: A part of it (not estimated here because it is absorbed by the variable $\hat{\Theta}_{dk't}$) is the consequence of the economic crisis in Russia, and about a third of the rest can be attributed to the conflict and the “smart sanctions” imposed by the EU.

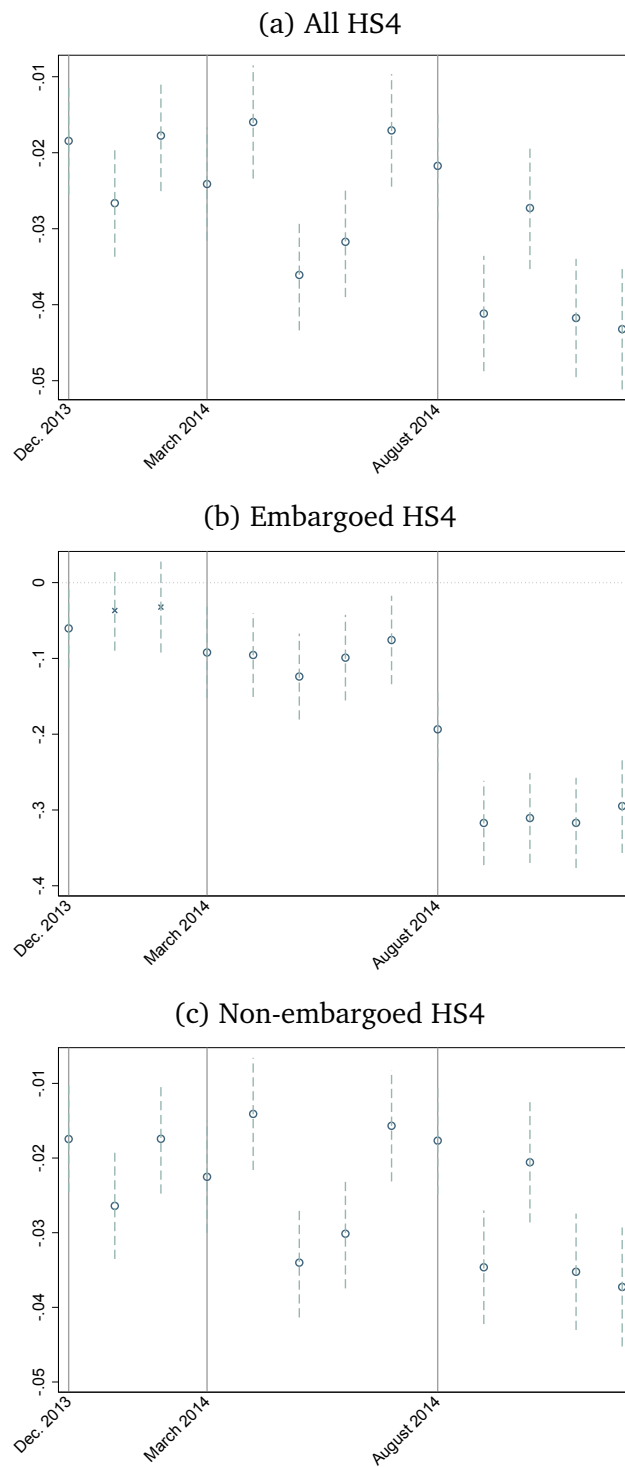


Figure 2.6: Estimated coefficients on treatment variable by month (Dec '13–Dec '14)

Tables B.9 and B.10 in the appendix test the robustness of the benchmark results. In columns (1)–(3) of table B.9, we replicate the benchmark regressions with a different control group. Instead of European countries, the control group is composed of Latin American countries.⁴¹ None of these countries imposed sanctions on Russia or were targeted by Russian counter-sanctions and are less likely to be affected by the treatment. The average treatment effects obtained with this alternative control group are slightly different than the benchmark results, but they are in same order of magnitude. The coefficients on the treatment dummies are a bit smaller and less precisely estimated, but we confirm that Western and Russian sanctions had a sizable negative impact on the probability of exporting to Russia. As in table 2.3, the drop in the probability of exporting increases with the escalation of sanctions, including for non-embargoed products. In columns (1)–(3) of table B.10, we report conditional logit estimates of the probability of exporting. Because we cannot factor out anymore the two sets of fixed effects, the specification is slightly different. In order to have a computationally feasible specification, we replace the firm \times time \times HS4 fixed effects by a time fixed effect. In order to control for possible firm-product-destination seasonal effects, we also introduce a dummy, Λ_{idkt} , set to one if a firm i exported product k to country d at date $t - 12$, which provides us with a specification which is a mix between a fixed effect model and a lagged dependent variable one. Again the results are in line with the ones shown in table 2.3. The average treatment effects are stronger than the benchmark estimates, but the conclusions are qualitatively the same.

Intensive Margins: Exporting Less or Cheaper?

We now turn to the investigation of the impact of the sanctions on the intensive margins. It is noteworthy that our data do not report all exporter-to-importer transactions but only total custom declarations consolidated at

⁴¹Argentina, Bolivia, Brazil, Columbia, Ecuador, Peru, Paraguay, Uruguay, and Venezuela.

Dep. var.	(1)	(2)	(3)	(4)	(5)	(6)
	Value			Price		
HS 4:	All	Embargoed	Non-embargoed	All	Embargoed	Non-embargoed
Russia	-0.036 ^c	-0.059	-0.036 ^c	-0.019 ^c	-0.035	-0.018 ^c
× Dec '13–Feb '14	(0.019)	(0.095)	(0.019)	(0.010)	(0.032)	(0.010)
Russia	-0.058 ^a	-0.096	-0.057 ^a	-0.029 ^a	-0.054	-0.028 ^a
× Mar '14–Jul '14	(0.017)	(0.100)	(0.017)	(0.009)	(0.035)	(0.009)
Russia	-0.077 ^a	-0.667 ^a	-0.070 ^a	-0.049 ^a	-0.030	-0.049 ^a
× Aug '14–Dec '14	(0.020)	(0.173)	(0.020)	(0.011)	(0.076)	(0.011)
$A_{d,t}$	0.256 ^a	-0.025	0.263 ^a	0.038 ^a	0.011	0.038 ^a
	(0.021)	(0.114)	(0.021)	(0.011)	(0.039)	(0.011)
Nb. Obs.	964820	21985	942835	964820	21985	942835
R ²	0.877	0.895	0.876	0.915	0.960	0.913

Notes: All regression include Firm × Destination × HS4 and Firm × time × HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm × HS4. Significance levels: ^c: p<0.1, ^b: p<0.05, ^a: p<0.01.

Table 2.4: Intensive margin: Export values - OLS

the firm-product-destination-month level. A single observation in our data may aggregate several transactions. Therefore, a decrease in the observed export value may be either the consequence of a decrease in the shipment value or of the interruption of a fraction of the commercial relationships a firm may have in Russia. In other words, we cannot claim that the results shown in this section have to be strictly interpreted in terms of changes in the intensity of trade relationships. Columns (1)–(3) of table 2.4 show the OLS estimates of equation 2.14. The results confirms that the political crisis in Ukraine and Russia not only led French firms to stop or delay their shipments to Russia but also to reduce export values. For non-embargoed products, the average monthly value of export shipment to Russia decreased by 3.5%, i.e. $1 - \exp(-0.036)$, between the start of the conflict and the implementation of first European sanction against the Russian Federation. The reduction in the export value reached 5.5% in the second period and 6.8% in the last one. For embargoed products, the impact is insignificant for the two first periods but, unsurprisingly, the Russian embargo had strongly negative consequences on export values. We suspect, however, that this effect is actually mainly driven by extensive margins effects for two reasons. First, as explained above, the Russian embargo covers most of the types of goods in each listed HS4, but not systematically all of them. Consequently, some firms may have

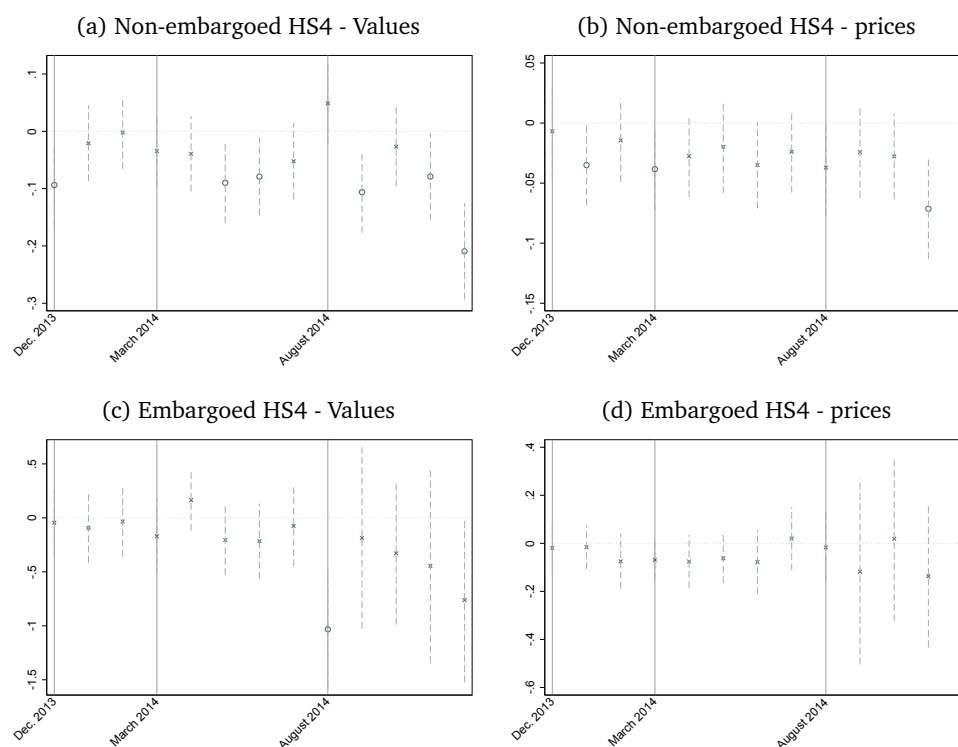


Figure 2.7: Estimated coefficients on treatment variable, by month (Dec '13–Dec '14)

had to stop exporting the products effectively banned by the embargo, but continued to sell other ones. Second, there might be a short period at the time of implementation during which some flows of products effectively banned could have crossed the border before its definitive closure.

In columns (4)–(6) of table 2.4 we estimate the same equation, but with the log of export prices (proxy by the ratio of export value over export quantity) as a dependent variable. Because OLS is a linear estimator and the log of the export value is the sum of the log of the export price and the log of the export quantity, the impact of the sanctions' regime on the quantity exported is simply the difference between the estimated average effects on export value and export prices. The results indicate that the price changes contributed a lot to changes in value of export flows to Russia. For non-embargoed products, the decrease of export prices explains almost exactly half of the decrease in export values. For the last

period, the contribution of changes in export prices is much larger. It explains about 70% of the decrease in the value of individual shipments. Figure 2.7 displays the respective monthly coefficients.

2.4.4 Differential Impact across Firms and Products and the Causes of Trade Disruption

Our baseline estimation results provide us with an average effect of the impact of sanctions on the extensive and intensive margin of exports. This average effect could hide a strong heterogeneity across firms or products. In this subsection, we exploit this possible heterogeneity in order to shed light on the nature of the trade impediments generated by the sanctions.

We do not exactly know how the impact of sanctions may vary across firms, as we do not know the exact nature of the trade frictions they generated. Of course, the Russian embargo on agricultural and food products is unambiguous. It simply banned imports of these products and undoubtedly stopped trade from all firms, irrespective of their characteristics. But determining the precise consequences of the trade impediments generated by the complex scheme of economic sanctions imposed by Western countries is much more challenging. Since we have excluded from the analysis the products listed by the EU to be subject to trade restrictions, the impact of the sanctions estimated in the previous sections must be channeled by less direct mechanisms. It seems very unlikely that the EU measures concerning economic cooperation (e.g., suspension of EU-Russia bilateral and regional cooperation programs), diplomatic relations (e.g., cancellation of a G8 summit, suspension of the negotiations over Russia's accession to the OECD), and asset freezes and visa bans applied to a handful of Russian citizens had a direct effect on the export flows to Russia. However, we suspect three mechanisms that may have been at work and contributed to the decline of export. The first possible mechanism could be an abrupt change of Russian consumers' preferences resulting from a spontaneous

boycott of Western products in reaction to the diplomatic gridlock. The second one is a sudden rise of economic, political, and legal instability that hindered business to do business in Russia or with Russian firms. Finally, it is possible that financial sanctions, i.e., restriction on dealings with Russian financial institutions, generated a disruption of the financing of trade. We cannot assess precisely the strength of each mechanisms because our data does not contain detailed information on the trading firms and the contractual agreement they have with their foreign partner. Nevertheless, the following subsections present three different tests aiming to provide suggestive evidence on whether any of these mechanisms had been at work. All these tests are conducted on the subsample of non-embargoed products.

Change in Consumers' Attitude

A first reason that could explain why the exports of non-embargoed products to Russia declined after the beginning of the conflict in the Ukraine (and further when the EU imposed sanctions) is an abrupt change of consumers' preferences. It is indeed possible that the Western sanctions have been perceived by Russian consumers as an unjustified interference in Russian affairs. If the diplomatic reaction of the Western governments has been perceived as a "Russia bashing," it could have deteriorated the brand image of Western products and led part of the Russian consumers to remove these products from their consumption basket.

Existing studies on the consequences of boycotts on international trade lead to diverging conclusions. However, several recent studies, including Michaels and Zhi (2010), Pandya and Venkatesan (2016), and Heilmann (2016),⁴² confirm that boycotts calls and, more generally, worsening con-

⁴²Heilmann (2016) studies the impact of various boycott campaigns. In particular, this chapter confirms Michaels and Zhi (2010)'s conclusion showing that the diplomatic clash between France and the United States over the Iraq War in 2003 reduced significantly the trade between the two countries during a short period of time.

sumer attitudes towards a foreign country have a sizable impact on trade volumes. In the case of Russia, we are not aware of any large scale boycott campaign against Western products. However, during summer 2014, the Russian government communicated its intention to ban Western food products in retaliation to the Western sanctions, organizing, for instance, the public destruction of illegally imported food. These official messages might have influenced consumers' decisions.

If a part of the impact estimated above is the consequence of a loss of popularity of Western products, we would expect a more severe trade disruption for consumer goods and varieties that are easily identified as Western products. Heilmann (2016) shows clearly that boycotts have larger effects on highly-branded products and consumer goods than on capital or intermediate ones. We base our identification strategy on the expected heterogeneous effect of the change in consumers' attitude across firms and products, by interacting our treatment variables with indicators of *made-in-label* visibility.

Table 2.5 shows the results for three different indicators of visibility. In columns (1) and (2) we take the export probability and export value equations 2.14 and 2.15 and add interactions with a dummy set to one for consumption goods.⁴³ In columns (3) to (4) we restrict the analysis to these consumer goods, but we now break up the analysis by whether consumer goods tend to be branded. This distinction is based on the presence of exporters of luxury varieties within a product category. The idea here is that luxury firms need to invest substantially in their brand image, which is possible only for consumption products that are easily

⁴³We use the classification by broad economic categories (BEC) provided by the United Nations to identify consumption products. The BEC groups the sections of the Standard International Trade Classification (SITC) according their main end use. It distinguishes food, industrial supplies, capital equipment and consumer goods. After matching the SITC classification with the HS, we coded as consumer goods the HS4 containing majority of HS6 identified in the BEC as "consumer goods," "food," and "Passenger motor cars."

Interaction term Dep. var	(1)	(2)	(3)	(4)	(5)	(6)
	Consumption goods		Goods w. luxury firms		Luxury firms	
	$\Lambda = 1$	Value	$\Lambda = 1$	Value	$\Lambda = 1$	Value
Ru. \times Dec '13–Feb '14	0.003	0.034	-0.003	-0.017	-0.009	-0.024
\times Interaction	(0.005)	(0.045)	(0.011)	(0.081)	(0.010)	(0.090)
Ru. \times Mar '14–Jul '14	0.008	-0.021	0.012	0.055	-0.003	-0.037
\times Interaction	(0.005)	(0.041)	(0.012)	(0.088)	(0.010)	(0.076)
Ru. \times Aug '14–Dec '14	-0.001	-0.070	0.014	0.004	-0.007	0.142 ^c
\times Interaction	(0.005)	(0.047)	(0.013)	(0.094)	(0.011)	(0.076)
Ru. \times Dec '13–Feb '14	-0.021 ^a	-0.048	-0.017	0.003	-0.017 ^a	-0.005
	(0.003)	(0.029)	(0.010)	(0.071)	(0.004)	(0.038)
Ru. \times Mar '14–Jul '14	-0.026 ^a	-0.049 ^c	-0.029 ^a	-0.110	-0.018 ^a	-0.058
	(0.003)	(0.026)	(0.011)	(0.081)	(0.004)	(0.038)
Ru. \times Aug '14–Dec '14	-0.028 ^a	-0.045	-0.035 ^a	-0.112	-0.030 ^a	-0.141 ^a
	(0.003)	(0.030)	(0.006)	(0.085)	(0.005)	(0.046)
$A_{d,t}$	0.040 ^a	0.263 ^a	0.035 ^a	0.284 ^a	0.036 ^a	0.284 ^a
	(0.004)	(0.025)	(0.006)	(0.041)	(0.006)	(0.041)
Nb. Obs.	3703896	1078272	1314900	363459	1314900	363459
R ²	0.617	0.892	0.607	0.905	0.607	0.905

Notes: All regression include Firm \times Destination \times HS4 and Firm \times time \times HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm \times HS4. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table 2.5: Interaction with brand visibility - Non-embargoed products

branded. The list of French exporters of luxury goods is provided by Martin and Mayneris (2015).⁴⁴ In order to identify the producers of luxury goods, they exploit the list of French firms that are member of the “Comité Colbert,” a French organization gathering the main brands of the French luxury industry with the objective to promote these high-end producers and defend their interests. Only 76 companies are members of this very select club, but Martin and Mayneris (2015) extend the list of luxury producers by identifying the firms that export the same goods in a comparable range of price. In columns (5) and (6), instead of differentiating the impact of the sanctions across different types of products, we look at whether the impact is different for these high-end producers, within their HS4. The underlying assumption here is that French luxury brands are highly visible and easily identified as “typically” French. Therefore, they may be potential targets of boycott calls and/or more sensitive to worsening attitudes towards French products.⁴⁵ Except

⁴⁴We thank Julien Martin and Florian Mayneris for sharing their data.

⁴⁵This hypothesis is in line with the evidence provided by Pandya and Venkatesan (2016). In their study of the consequence of the diplomatic conflict between France and

for a small unexpected positive coefficient in column (6), none of these interaction terms is significantly different from zero. This discards the hypothesis that sudden changes in consumer preferences contributed greatly to the drop of French exports to Russia after December 2014.

Firm Size and Country Risk

A second explanation for the negative impact estimated in the previous sections could be a sudden rise of economic and/or political insecurity perceived by exporting firms. Until firms are reassured on the security of their shipments and know more about the new regulatory environment, businesses may be inclined to reduce their shipments and stop or delay their search of new business opportunities.

Again, our data do not offer a direct way to test whether this reaction of exporters to insecurity may have contributed to the decline of exports to Russia. However, looking at whether the impact of the political turmoil varies according to the size and the experience of exporters is a way to enlighten us on this question. It is indeed sensible to expect larger and more experienced exporters to be less affected by political instability, either because they can afford higher exports cost, they have a better ability to deal with complex situations in cross-border relationships, or because their international transactions are likely to be based on larger and more stable networks of customers. The existing literature on firms' dynamics on export markets confirms that persistence on export markets increases with the firms' size and length of export experience (e.g., Timoshenko (2015), Berman et al. (2015), Bricongne et al. (2012)). Haidar (2014) also shows that the sanctions against Iran affected most severely the small Iranian exporters.

the United States over the war in Iraq, they show that brands that are the most clearly *perceived* as French are the most impacted by the boycott campaign.

Interaction term Dep. var	(1)	(2)		(3)	(4)	(5)		(6)
	$\Lambda = 1$	Size		Price	$\Lambda = 1$	Dependence		Price
		Value				Value		
Russia × Dec '13–Feb '14	0.002 ^b	-0.009		-0.008	-0.051 ^a	-0.442 ^a		0.022
× Interaction	(0.001)	(0.011)		(0.007)	(0.007)	(0.085)		(0.048)
Russia × Mar '14–Jul '14	0.001	-0.026 ^b		-0.000	-0.075 ^a	-0.465 ^a		-0.078 ^c
× Interaction	(0.001)	(0.010)		(0.006)	(0.007)	(0.080)		(0.043)
Russia × Aug '14–Dec '14	0.000	-0.037 ^a		-0.001	-0.106 ^a	-0.627 ^a		-0.166 ^a
× Interaction	(0.001)	(0.012)		(0.007)	(0.007)	(0.093)		(0.047)
Russia × Dec '13–Feb '14	-0.016 ^a	-0.037		-0.020 ^c	-0.020 ^a	-0.038 ^c		-0.018
	(0.003)	(0.023)		(0.012)	(0.002)	(0.023)		(0.012)
Russia × Mar '14–Jul '14	-0.020 ^a	-0.064 ^a		-0.028 ^b	-0.023 ^a	-0.060 ^a		-0.029 ^b
	(0.004)	(0.021)		(0.011)	(0.002)	(0.021)		(0.011)
Russia × Aug '14–Dec '14	-0.028 ^a	-0.079 ^a		-0.049 ^a	-0.029 ^a	-0.073 ^a		-0.049 ^a
	(0.004)	(0.024)		(0.013)	(0.003)	(0.024)		(0.013)
$A_{d,t}$	0.040 ^a	0.263 ^a		0.038 ^a	0.040 ^a	0.261 ^a		0.038 ^a
	(0.004)	(0.025)		(0.013)	(0.004)	(0.025)		(0.013)
Nb. Obs.	3703896	1078272		1078272	3703896	1078272		1078272
R ²	0.617	0.892		0.928	0.617	0.892		0.928

Notes: All regression include Firm × Destination × HS4 and Firm × time × HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm × HS4. Significance levels: ^c: p<0.1, ^b: p<0.05, ^a: p<0.01.

Table 2.6: Interaction with firm size and dependence to Russia - Non-embargoed products

In columns (1)–(3) of table 2.6, we interact the three binary treatment variables with an indicator of firm size. This interaction variable is, for each firm and HS4, the log of the total export sales of the firm before the treatment period, i.e. between January 2011 and November 2013, over total French export of the HS4. This variable, which is invariant over time, is larger when the firm exported relatively large values compared to other French exporters of the same HS4, and/or when the firm has been active on foreign markets for a relatively long time. The results confirm that big exporters are more resilient when facing political uncertainty: The positive coefficient reported in the first row of column (1) indicates that their probability of exporting to Russia is relatively less impacted by the surge of the military conflict. However, this small advantage disappears in the second and third periods, when “smart sanctions” and economic sanctions are implemented. On the contrary, their intensive margin (column 2) is significantly more affected by the sanctions than the one of smaller exporters. In columns (4)–(6), the interaction variable is an indicator of dependence on the Russian market. As dependence we define here for each firm its total sales of a given HS4 in Russia prior the political events

(from January 2011 to November 2013), divided by the total exports of the firm during the same period. Again, we can reasonably expect firms that mainly export to Russia to have better knowledge of this market and are therefore less sensitive to the rise of political insecurity. However, the results are at odds with this hypothesis. Almost all the interaction terms are significantly negative, which indicates that firms that are more dependent on their export to Russia are more affected by the events. More dependent firms are more likely to reduce the frequency of their shipments, to reduce the price they charge and the quantity exported. Importantly, the impact on these firms specialized on the Russian market increases over time: It is significantly larger in periods 2 and 3, when the sanctions are implemented. All together, these results indicate that growing uncertainty about the political environment is probably not the main cause of the fall of trade, at least as soon as the Western sanctions have been implemented. Instead, the negative signs on the interaction variables are in line with an alternative explanation based on the disruption of the provision of trade finance services induced by Western sanctions. The next subsection explores this question more thoroughly.

Disruption of Trade Finance

The financial sanctions imposed by Western countries on major Russian banks have partly disrupted the financial relationships between the sanctioning countries and Russia.⁴⁶ The measures did not directly target the provision of trade finance services, but aimed at putting constraints on the (re)financing of Russian banks.

As Western sanctions were generally aimed at coercing the Russian state into changing its political course through targeting these institutions, it is likely that the applied restrictions negatively impacted the provision

⁴⁶The five Russian banks directly hit by the EU sanctions are Sberbank (the largest Russian bank and the third largest bank in Europe), VTB Bank, Gazprombank, Vnesheconombank and Rosselkhozbank.

of trade finance services and affected trade flows dependent on these. Three mechanisms are plausible: First, the sanction undoubtedly weakened major Russian banks financially, reducing their capacity to offer competitive financial services. Second, even before the sanction were put in place, it is possible that banks and trading firms internalized the risk of seeing some financial activities being forbidden. They may have stopped or delayed pending transactions, until having guarantees on their legality. Third, even after the release of the official EU resolution establishing the financial sanctions against Russia, some doubt persisted about their scope, constituting a source of uncertainty. This is underlined by the fact that the EU commission felt the need to publish a subsequent guidance note in December 2014 concerning the implementation of certain provisions of the financial sanctions.⁴⁷ The note aimed at clarify the interpretation of some aspects of the regulation establishing the sanctions, including those relating to the provision of financial services by Russian banks. The note confirmed that “EU persons can process payments, provide insurance, issue letters of credit, extend loans, to sanctioned entities.” At the same time the note remarks that the clarification followed questions that had been brought forward to the EU Commission, suggesting that some actors felt legal uncertainty about the coverage of the sanctions and needed a clarification.

In order to assess the role of this possible link between the sanctions and trade, we look at whether the magnitude of the impact of the sanctions is related to the importance of the usage of trade finance instruments. Unfortunately, we again face data limitations. We do not have any information about usage of trade finance instruments by French exporters directly. In fact, information of this kind is very rare. Most of the existing empirical literature on the importance of trade finance is based on partial and very limited data,⁴⁸ or on information on firm-bank links that are not

⁴⁷Commission Notice of 16.12.2014, http://europa.eu/newsroom/files/pdf/c_2014_9950_en.pdf.

⁴⁸For instance, the empirical analysis provided by Antràs and Foley (2015) in support

specific to the provision of trade finance instruments.⁴⁹ There are also a few studies using detailed information, but restrict the analysis to a single country. Schmidt-Eisenlohr and Niepmann (2015) and Niepmann and Schmidt-Eisenlohr (2015) exploit data on U.S. banks allowing the provision of trade finance services for US international trade transactions across the world. Finally, two papers exploit very detailed firm-level data: Demir and Javorcik (2014) for Turkey and Ahn (2015) for Colombia and Chile. This literature shows that the use of trade finance instruments varies greatly across firms, partner countries and products. Our empirical strategy is based on the variance across products. In the spirit of many empirical studies on the consequence of financial development, which exploit the variation in financial vulnerability across sectors computed from firm-level data for a reference country,⁵⁰ the identification of the role of trade finance is based on an interaction between our variables of interest and a product-level indicator of dependence on trade finance.

The indicator we use is calculated from the data exploited by Demir and Javorcik (2014).⁵¹ Their data covers the universe of Turkish exports disaggregated by exporter, product, destination, and financing terms for 2003-2007. Three types of financing terms supporting international trade contracts are identified: “Cash-in-advance” (the importer pays before the arrival of the good and bears the risk), “open account” (the importer pays after the arrival and the exporter bears the risk) and “letters of credits” (a bank intermediary secures the payment on behalf of the importer confirming that the exporter meets the requirements specified in the contract). We aggregate this information to compute, for each HS4, the share of Turkish trade paid for by Letters of Credits.⁵² Needless to say, Turkey is not Russia. However the two countries share a lot of similarities and we can

of their theoretical model is based on information for a single U.S.-based exporter.

⁴⁹See e.g. Paravisini et al. (2014).

⁵⁰See e.g. Manova (2013).

⁵¹We are deeply indebted to Banu Demir for providing us with these indicators.

⁵²As a robustness check, we also used the share of French exports to Turkey using Letters of Credits. The results (unreported but available from the authors upon request) are very similar to the ones reported in table 2.7.

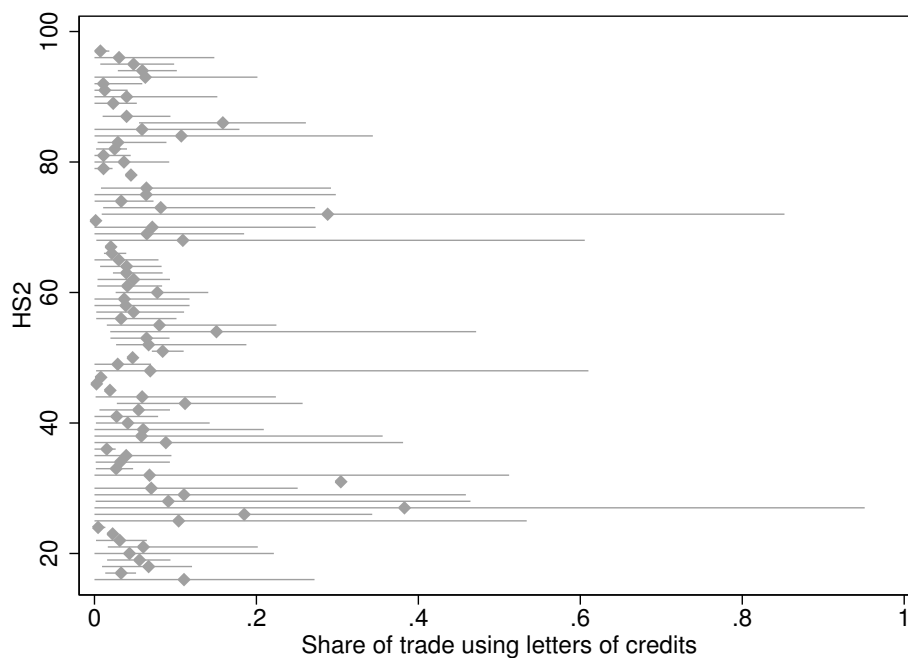


Figure 2.8: Trade finance dependence: Share of trade using letters of credits by HS2 (mean, max and min)

be confident that French firms that export towards these countries make very comparable decisions regarding their choice of payment contract. Russia and Turkey are both emerging countries, with comparable GDP per capita. More importantly for the choice of the financing terms that support international trade, they are equally distant to France and they have quite comparable levels of development of their financial systems (the recent literature on trade finance has revealed that these two variables influence greatly the usage of letters of credits). According to the financial development indicator proposed by Svirydzenka (2016), Russia is ranked 32nd in the world and Turkey is 37th.⁵³ It is noteworthy that the use of Turkish data is not only motivated by the lack of data for most Russia. It is also a way to obtain indicators that are exogenous to the economic and political situation in Russia.

⁵³In the ranking proposed by the World Economic Forum (World Economic Forum, 2012), Russia is ranked 39th and Turkey 42th.

	(1)	(2)	(3)
	$\Lambda = 1$	Value	Price
Russia \times Dec '13–Feb '14	0.005	0.337	0.027
\times Trade Finance	(0.033)	(0.248)	(0.137)
Russia \times Mar '14–Jul '14	-0.066 ^b	-0.103	0.052
\times Trade Finance	(0.028)	(0.209)	(0.101)
Russia \times Aug '14–Dec '14	-0.051 ^c	0.188	0.222 ^b
\times Trade Finance	(0.028)	(0.241)	(0.108)
Russia \times Dec '13–Feb '14	-0.021 ^a	-0.046 ^b	-0.019 ^c
	(0.002)	(0.019)	(0.010)
Russia \times Mar '14–Jul '14	-0.021 ^a	-0.053 ^a	-0.030 ^a
	(0.002)	(0.015)	(0.008)
Russia \times Aug '14–Dec '14	-0.026 ^a	-0.084 ^a	-0.054 ^a
	(0.002)	(0.018)	(0.009)
$A_{d,t}$	0.041 ^a	0.264 ^a	0.037 ^a
	(0.003)	(0.020)	(0.011)
Nb. obs.	3599892	1049526	1049526
R ²	0.617	0.891	0.926

Notes: All regression include Firm \times Destination \times HS4 and Firm \times time \times HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm \times HS4. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table 2.7: Interaction with dependence to trade finance - Non-embargoed products

After matching this source with our trade data, we have information on the use of letters of credit for 794 HS4-level products, all of which are not targeted by the economic sanctions imposed by the EU or the Russian Federation. For most HS4, the share of trade using letters of credit is very small. The average is less than 7%, but the median value is only 3.7%. However, this share varies a lot across HS4. The standard deviation is 0.10, with a maximum reaching 95.1%. The variance is also substantial within broader categories of products. In Figure 2.8, we report the average value across chapters of the HS classification (HS2), along with the maximum and minimum levels. There are clearly some categories of products for which it is relatively common to rely on letters of credits. This is mainly the case for raw materials such as minerals, basic chemicals or metals. Within most chapters, however, and in particular in those showing high averages, the variance across HS4 is substantial.

In table 2.7 we report the coefficients for the export decision, value and price regressions with interaction terms between the treatment dummies and our product-level measure of dependence to trade finance. As expected, we find that the reaction to the political shocks is higher for product categories where the usage of trade finance instruments is more widespread. Interestingly, the coefficient on the interaction term is significantly negative for the export participation only (column 1) and for periods 2 and 3 during which financial sanctions against Russian banks are active. This coefficient is clearly insignificant during the first period, when country risk increased but the supply of financial services was not restricted yet. The average treatment effect on the value of the shipments (column 2) does not vary with trade finance dependence, but we observe a comparatively large effect on export prices (column 3) for the last period. Put together, these results suggest that those trade flows to Russia that rely on bank intermediation services have been disrupted or delayed by the implementation of EU financial sanctions, and demanded a risk premium when they managed to keep exporting.

Existing evidence on the usage of trade finance indicates that the provision of these services involves substantial fixed costs for the trading companies. Consequently, they are preferred for larger transactions. Niepmann and Schmidt-Eisenlohr (2015) show that the average value of “letter of credit”-financed transactions with the United States is about 18 times larger than those transactions that do not rely on bank intermediation. If the impact of the sanctions on international trade is partially due to a disruption of the supply of trade finance services, we should expect that the impact is the greatest for large transactions. Again, testing directly this hypothesis is not feasible with the data at hand, as we do not have information on the volume of each transaction, but just monthly aggregations of firms export declarations.

Nevertheless, table 2.8 shows indirect evidence. Here, we test whether firms that tend to send large shipments to Russia are more affected by

	(1)	(2)	(3)	(4)	(5)
Dep. Var.: Export probability					
HS4	All	Q1	Q2	Q3	Q4
Russia × Dec '13–Feb '14	0.001	-0.000	0.002	0.001	0.000
× Transaction Size	(0.001)	(0.003)	(0.002)	(0.002)	(0.003)
Russia × Mar '14–Jul '14	-0.001	0.002	-0.000	-0.000	-0.004 ^c
× Transaction Size	(0.001)	(0.003)	(0.002)	(0.002)	(0.002)
Russia × Aug '14–Dec '14	-0.004 ^a	-0.005	-0.003	-0.003	-0.006 ^b
× Transaction Size	(0.002)	(0.007)	(0.004)	(0.004)	(0.003)
Russia × Dec '13–Feb '14	-0.021 ^a	-0.011	-0.023 ^a	-0.025 ^a	-0.016 ^a
	(0.002)	(0.007)	(0.004)	(0.004)	(0.006)
Russia × Mar '14–Jul '14	-0.022 ^a	-0.025 ^a	-0.019 ^a	-0.022 ^a	-0.028 ^a
	(0.002)	(0.007)	(0.005)	(0.004)	(0.006)
Russia × Aug '14–Dec '14	-0.028 ^a	-0.030 ^a	-0.028 ^a	-0.028 ^a	-0.027 ^a
	(0.003)	(0.008)	(0.005)	(0.004)	(0.006)
$A_{d,t}$	0.041 ^a	0.021 ^c	0.043 ^a	0.039 ^a	0.053 ^a
	(0.004)	(0.011)	(0.007)	(0.006)	(0.008)
Nb. obs.	3599892	437508	1136880	1363572	661932
R ²	0.617	0.598	0.633	0.610	0.614

Notes: All regression include Firm × Destination × HS4 and Firm × time × HS4 fixed effects. Data for all non-embargoed HS4 in column (1), and HS4 in the first, second, third and fourth quartiles of trade finance dependence in columns (2)-(5) respectively. Robust standard errors in parentheses are clustered by Firm × HS4. Significance levels: ^c: p<0.1, ^b: p<0.05, ^a: p<0.01.

Table 2.8: Interaction with transaction size - Non-embargoed products

the sanctions. Our proxy for the shipment size is the average monthly value of (strictly positive) export declarations to Russia over the period covering all months between January 2011 and November 2013.⁵⁴ Results reported in column (1) show that firms exporting larger shipments are more likely to interrupt or delay their shipments to Russia in the third period. This finding corroborates the results of table 2.6. In columns (2) to (4) we check whether the overreaction of firms with larger shipments is greater for products with trade finance dependence. In each column, we restrict the sample to the HS4 products belonging to a quartile of the distribution of our trade finance dependence indicator (Q1 is the bottom quartile and Q4 the top one). The results confirm the hypothesis that for products with a greater dependence on trade finance large transactions are most affected.

⁵⁴Unreported regressions confirmed the robustness of our results with proxies based on shorter (and more recent) periods.

2.5 Trade Diversion

The decline in the exports to Russia identified in the previous sections are not necessarily a deadweight losses.⁵⁵ As exporting to the Russian Federation became more difficult, French firms may have found new business opportunities in other countries and partly compensated their losses on the Russian market. They may also have found ways to circumvent the sanctions by selling to some intermediary firms located in a country not involved in the diplomatic conflict—and not hit by counter-sanctions—in order to re-export to Russia.⁵⁶ However, it is also possible that the disruption of trade with Russia have affected exporters' cash-flow and their capacity to finance their activities in other markets. In this case, sales in different export markets would be positively correlated and we could expect an additional negative impact of the sanctions on exports of affected firms.⁵⁷ Our empirical strategy to evaluate the impact of the sanctions on exports of French exporters to Russia to alternative destinations is again a simple difference-in-differences estimation. Here, we compare the trends of export performances on non-Russian markets of firms that have been directly exposed to the sanctions to the ones of non-exposed firms. We estimate the following specification:

$$\text{TradePerformance}_{idkt} = \beta[\text{RUexporter}_{ik,t0} \times \text{PostSanctions}_t] + \theta_{idk} + \theta_{dkt} + \varepsilon_{idkt}, \quad (2.16)$$

where subscripts i , k , d and t as before denote firms, products, destinations and time, respectively. $\text{TradePerformance}_{idkt}$ is alternatively the probability that firm i exports good k to country d at time t , the log of the value exported or the log of the export unit value. θ_{idk} and θ_{dkt} are firm \times

⁵⁵In fact, the estimated pseudo-production figures for the computation of general equilibrium counterfactual trade flows in section 2.3 yields little difference between observed and predicted figures for France.

⁵⁶Haidar (2014) observes very strong trade diversion effects in the case of Iran. Iranian firms that used to export to countries imposing an embargo have increased their exports of the same product to non-sanctioning destinations.

⁵⁷Berman et al. (2015) provide empirical evidence of such a positive correlation between sales on different markets.

product \times destination and destination \times product \times time fixed effects. The treatment dummy is $[RUexporter_{ik} \times PostSanctions_t]$. It is set to one during the time when sanctions are active and when firm i exported the product k to Russian before the sanctions. We estimate this equation on the universe of French firm-level exports to any destination but Russia. Therefore, the average treatment effect, β , indicates whether firms that have been directly exposed to the sanctions—having exported to Russia the diplomatic conflict—performed better or worse than other French exporters on non-Russian markets. For the estimations, we focus on the months during which the sanctions are the most severe by retaining two periods only: the economic sanctions period (from August 2014 to November 2014) and the comparable pre-conflict period (from August 2013 to November 2013).

Equation 2.16 compares the trade performance of firms exporting to Russia in 2013 to the performance of firms that did not exported there. To be sure that the appearance or interruption of exports to a given destination is not the consequence of “newborn” or “dead” firms starting up or closing down, we eliminate firms which do not report any trade flows in one period or the other. We also refine the estimation by trimming the control group. Russia is an important destination for French exports, but it is clearly not the most common one. Therefore, firms that export to Russia prior to the sanctions may have unobservable characteristics that differ greatly from the ones that do not export to Russia. If those characteristics are also correlated with the evolution of firms’ export performances on all markets the estimation results might be biased. We alleviate this potential source of bias by reducing the sample to firms that share a similar probability of being treated.⁵⁸

⁵⁸To do so, we implement a simple matching strategy: We eliminate treated firms that have very different characteristics from non-treated firms and vice versa, based on the probability to export to Russia in 2013 computed for each firm. To obtain the probability of being treated, we regress the dummy $RUexporter_{ik}$ on the total exports of the firm i between August and November 2013, the number of destinations the firm exports to during this period, a dummy set to 1 if the firm exports to countries that are former soviet republics (except Ukraine and Russia) and a product fixed effect. Among the non-treated firms, we drop those firms that have a probability to be treated below the 10th percentile

Embargoed Products							
	Dep. var.	Matched	Destinations	Coef.	s.e.	Nb. Obs.	R ²
(1)	$\Lambda = 1$	No	All	-0.054 ^a	(0.017)	75254	0.454
(2)	Value	No	All	-0.010	(0.035)	46798	0.948
(3)	Price	No	All	-0.010	(0.011)	46798	0.970
(4)	$\Lambda = 1$	Yes	All	-0.022	(0.026)	33954	0.485
(5)	Value	Yes	All	0.008	(0.078)	21256	0.945
(6)	Price	Yes	All	-0.017	(0.025)	21256	0.974
(7)	$\Lambda = 1$	Yes	Sanctioning	-0.036	(0.028)	25360	0.473
(8)	Value	Yes	Sanctioning	0.011	(0.097)	17286	0.946
(9)	Price	Yes	Sanctioning	-0.015	(0.022)	17286	0.974
(10)	$\Lambda = 1$	Yes	Not Sanctioning	0.008	(0.048)	8594	0.494
(11)	Value	Yes	Not Sanctioning	-0.003	(0.121)	3970	0.938
(12)	Price	Yes	Not Sanctioning	-0.026	(0.085)	3970	0.972
Non-embargoed Products							
	Dep. var.	Matched	Destinations	Coef.	s.e.	Nb. Obs.	R ²
(13)	$\Lambda = 1$	No	All	-0.032 ^a	(0.003)	2122716	0.400
(14)	Value	No	All	-0.023 ^a	(0.007)	1121660	0.938
(15)	Price	No	All	0.003	(0.004)	1121660	0.955
(16)	$\Lambda = 1$	Yes	All	0.024 ^a	(0.008)	769498	0.415
(17)	Value	Yes	All	-0.005	(0.023)	373888	0.934
(18)	Price	Yes	All	0.014	(0.014)	373888	0.952
(19)	$\Lambda = 1$	Yes	Sanctioning	0.019 ^b	(0.009)	530416	0.416
(20)	Value	Yes	Sanctioning	0.001	(0.025)	294494	0.935
(21)	Price	Yes	Sanctioning	0.020	(0.015)	294494	0.951
(22)	$\Lambda = 1$	Yes	Not Sanctioning	0.034 ^a	(0.013)	239082	0.395
(23)	Value	Yes	Not Sanctioning	-0.022	(0.042)	79394	0.924
(24)	Price	Yes	Not Sanctioning	-0.006	(0.027)	79394	0.954

Notes: All regression include Firm \times Destination \times HS4 and Destination \times Time \times HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm \times HS4. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table 2.9: Trade diversion

Table 2.9 shows the results for embargoed and non-embargoed products. Lines (1) and (13) show a negative impact of the treatment on the probability of exporting, which suggests that the firms that exported to Russia in 2013 are less likely to enter a new market (or more likely to exit a foreign market) than other firms. However, this negative impact disappears once we restrict the sample so that the probability to be treated for the distribution. Among the treated ones, we drop all firms with a probability of being treated above the 90th percentile.

	Dep. var.	Coef.	Interaction with firm size			Nb. Obs.	R ²
			s.e.	Interaction	s.e.		
Embargoed products							
(1)	$\Lambda = 1$	-0.028	(0.028)	0.002	(0.003)	33954	0.486
(2)	Value	0.060	(0.085)	-0.016 ^b	(0.007)	21256	0.945
(3)	Price	-0.007	(0.028)	-0.003	(0.002)	21256	0.974
Non-embargoed products							
(4)	$\Lambda = 1$	0.022 ^a	(0.008)	0.000 ^b	(0.000)	769498	0.415
(5)	Value	0.000	(0.023)	-0.000	(0.000)	373888	0.934
(6)	Price	0.014	(0.014)	-0.000	(0.000)	373888	0.952
Interaction with firm dependence to Russia							
Embargoed products							
(7)	$\Lambda = 1$	-0.008	(0.026)	-0.160	(0.142)	33954	0.486
(8)	Value	-0.005	(0.079)	0.186	(0.341)	21256	0.945
(9)	Price	-0.022	(0.027)	0.064	(0.104)	21256	0.974
Non-embargoed products							
(10)	$\Lambda = 1$	0.019 ^b	(0.009)	0.061	(0.041)	769498	0.415
(11)	Value	-0.020	(0.024)	0.280 ^b	(0.123)	373888	0.934
(12)	Price	0.015	(0.015)	-0.023	(0.072)	373888	0.952

Notes: All regression include Firm \times Destination \times HS4 and Destination \times Time \times HS4 fixed effects. Matched samples. Robust standard errors in parentheses are clustered by Firm \times HS4. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table 2.10: Trade diversion - Interaction with firm size and dependence to Russia

treated and non-treated firms has comparable support. With the matching approach, we do not observe any significant impact of the treatment on export performances for embargoed products. Firms that directly suffered the consequences of the Russian embargo on food and agricultural products did not manage to compensate their loss by increasing their exports to alternative destinations. For non-embargoed products, the matching approach reveals a significant trade diversion effect: firms that have exported to Russia in 2013 have increased their probability of exporting to another destination in 2014, and especially to non-sanctioning countries. However, the impact is small in magnitude⁵⁹ and we do not observe significant changes in the intensive margins.

⁵⁹The average estimated probability of exporting in 2014 for treated firms is about 0.73, which means that the probability of exporting to a given destination is increased, on average, by less than 3.4% by the treatment.

In table 2.10, we interact the treatment dummy with measures of firm size (i.e. the sum of exports during the pre-conflict period) and firm dependence to the Russian market (i.e. the share of exports to Russian on total export of the firm during in the pre-conflict period). We find little evidence in favor of a heterogeneous effect of the treatment across firms. The interaction terms are non-significant, except in rows (4) and (11) that report small and imprecisely estimated positive coefficients.

The estimation results shown in tables 2.9 and 2.10 suggest that the French firms exposed to the disruption of the Russian market did not massively shifted sales to other markets. However, these results are only marginal effects which are silent about the magnitude of the trade diversion. If the firm's exports to Russia prior the events were small relative to the exports to other nations, a slight increase of the latter would be enough to compensate the losses incurred on the Russian market. In order to evaluate the total loss of sales for firms that have been exposed to the Russian conflict, we aggregate all exports at the firm-product-time level and estimate the following difference-in-difference specification:

$$\begin{aligned} \text{Total Exports}_{ikt} = & \beta_2[\text{RUexporter}_{ik,t0} \times \text{PostSanctions}_t] \\ & + \theta_{ik} + \theta_{kt} + \varepsilon_{ikt}. \end{aligned} \quad (2.17)$$

Again, we retain two periods: From August 2013 to November 2013 and from August 2013 to November 2013. $\text{Total Exports}_{ikt}$ is the sum of all export of product k by firm i in period t (including exports to Russia). The treatment dummy ($\text{RUexporter}_{ik,t0} \times \text{PostSanctions}_t$) is the same as the one in equation 2.16, and we include firm \times product and period \times product fixed effects. The average treatment effect, β_2 , therefore measures the change in total exports of exposed firms, relative to non-exposed ones. A non-significant coefficient would indicates that firms exporting to Russia in 2013 managed to fully divert their trade to other destinations (or that the exports to Russia were totally marginal in their total exports). A negative β_2 would mean that these exposed firms incurred a net reduction in their

	Dep. var.	Matched	Coef.	s.e.	Nb. Obs.	R ²	% Exported to Russia
Embargoed Products							
(1)	Value	No	-0.313 ^a	(0.075)	16858	0.949	20.85
(2)	Value	Yes	-0.278 ^a	(0.112)	5452	0.957	27.89
(3)	Quantity	No	-0.291 ^a	(0.075)	16858	0.955	20.53
(4)	Quantity	Yes	-0.229 ^b	(0.111)	5452	0.962	27.12
Non-embargoed Products							
(5)	Value	No	-0.202 ^a	(0.014)	362098	0.931	19.15
(6)	Value	Yes	-0.131 ^a	(0.028)	113814	0.932	25.26
(7)	Quantity	No	-0.173 ^a	(0.015)	362098	0.940	18.45
(8)	Quantity	Yes	-0.079 ^a	(0.030)	113814	0.946	24.34

Notes: All regression include Firm \times HS4 and Time \times HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm \times HS4. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$. The last columns reports the average share of exports to Russia in total exports of exposed firms in period 1.

Table 2.11: Trade diversion - Quantification

export sales. As for tables 2.9 and 2.10, we performed the regressions on the whole sample and the sample of matched firms.

The regression results are shown in table 2.11. The estimated average treatment effects confirm the narrative from above. Firms that exported to Russia before the events, were not able to fully recover their lost trade by shifting to other markets. On the contrary, row (2) shows that those firms that exported agricultural and food products targeted by the Russian embargo saw their total exports decrease by 24.3 %, almost equivalent to their pre-events share of exports to Russia (27.89 %). The exported quantity (row 4) saw a decline by 20.5 %, less than the pre-events share of exports to Russia (27.12 %), which suggests that some trade flows were diverted to other markets—albeit at lower prices. The results for non-embargoed products also saw a significant decline of total exports of firms caught up in the Russian turmoil. Since trade of these products to Russia has not been totally interrupted, the loss of foreign sales by exposed firms is less stark. The total export values for these firms (row 5) decreased by on average 12.3 % and total export quantities by 7.6 %.

Overall, trade diversion effects remain therefore very limited. Unlike in previous related research looking at the impact in *target* countries as in Haidar (2014), the ability of firms to quickly respond and shift sales to new or existing other markets, aside from the sanctioned country, is inadequate to counter losses incurred.

2.6 Conclusion

In this chapter, we evaluate and quantify the effects of the sanctions regime by the European Union and allied countries against the Russian Federation and their counter-sanctions. We complement the existing literature by focusing our analysis on the impact on the *sender* countries of the sanctions. The case of the Western-imposed sanctions on the Russian Federation is particularly instructive due to the strength of pre-conflict trade ties and the variety of policy options employed.

We conduct the analysis from two perspectives: We first gauge the global effects in a gravity setup, highlighting the heterogeneous impact on the different sanctioning countries involved. Using monthly trade data from UN Comtrade, we perform a general equilibrium counterfactual analysis that allows us to put a price tag on the policies put in place. We find that the global “lost trade”, the difference between predicted and observed trade flows, amounts to US\$3.2 billion per month. This cost on private actors is very unevenly distributed among countries, with European Union member states bearing 76.7% of the overall impact. Interestingly, the bulk of the “lost trade,” 83.1%, is incurred through *non-embargoed* products, and can hence be considered “collateral damage.”

In order to gain a deeper understanding of the root causes of this heterogeneity in the global impact, we then drill deeper using a rich dataset of monthly French firm-level exports. We investigate the micro effects

along the intensive and extensive margins and examine possible channels through which the exports of *non-embargoed* products are hurt. We find significant effects on both intensive and extensive margins—the probability to export any given good to Russia drops by on 8.2%–14.1% and the average shipment values decreased by 3.5%–7.5%. Again, significant effects are found for non-embargoed products, supporting the country-level evidence of substantial “collateral damage.”

While a direct identification of a mechanism explaining this “collateral damage” is difficult, we find strong suggestive evidence that financial sanctions impeded the provision of trade finance services, causing firms and products relying on financial intermediation to cease or roll back sales in the Russian Federation. The data reject plausible alternative mechanisms: We find that neither consumer boycotts, i.e., a sudden change in preferences, or perceived country risk can account for the decline.

Finally, we investigate whether affected French exporters diverted their sales to other markets after being hit with restrictions to the Russian market. Firms that were directly exposed to Russian counter-sanctions, i.e., previously exported certain agricultural or food products later targeted by counter-sanctions by the Russian Federation, were not able to recover their loss by expanding sales to new or existing destinations aside from Russia. These firms that were not directly hit by counter-sanctions, i.e., those previously exporting to the Russian Federation, did serve more markets afterwards, but did not increase flows to existing partner countries. Overall, trade diversion effects remain insignificant or very small in magnitude.

Shedding light on the impact of sanctions on the sender countries opens up new boxes of intriguing questions. What happens to firms in sender and target countries engaged in trade after the lifting of sanctions? Are previous business networks revived or do sanctions imply structural changes? We refer these to further research.

3

Politics of Global Value Chains¹

3.1 Introduction

“Multinationals are very nervous now, and they should be. [...] In the past, only some sectors—mining, oil and gas, commodity companies—had to worry about geopolitics. Now companies that make fizzy drinks or handbags or chocolate are finding their supply chains, their markets, their operations completely blown apart by geopolitical risks and unfavorable treatment.”

— Mark Leonard, co-founder of the
European Council on Foreign Relations²

The proliferation of global value chains makes the domestic production of goods increasingly dependent on inputs from foreign sources. By expanding their sourcing portfolio to foreign suppliers, firms and by extension entire economies are more prone to the trade effects of adverse bilateral

¹Joint work with Elsa Leromain (Univ. Paris 1 Panthéon-Sorbonne and Paris School of Economics; E-mail: Elsa.Leromain@univ-paris1.fr). We thank Lionel Fontagné, Matthieu Crozet, Thomas Chaney, Jeffrey Nugent, Maria Bas and participants of the GSIE seminar, ETSG 2015, ERF Forum 2016, SMYE 2016 and the Doctorissimes for their comments and suggestions.

²From “The great unraveling of globalization”, Washington Post by Jeffrey Rothfeder on April 24, 2015.

political shocks. In this chapter, we analyse the relation between political relations and trade at the industry level, allowing for a heterogeneous effect by types of inputs. We hypothesize that political relations matter more for *critical* goods.³ As critical goods we define foreign inputs used intensively directly and indirectly for the production of goods that are domestically consumed.⁴

We develop a simple theoretical model to illustrate the proposed mechanism. The rationale for a greater importance of political tensions for trade of critical goods is that a shock to the price of a critical input has a greater impact on the total production of an economy than a shock to other imported inputs. The more an economy is dependent on a specific product, the greater is the decrease in aggregate output. From the theoretical model we can directly derive a measure of *dependence* for each country product pair.

Our empirical analysis aims at testing our theoretical prediction in reduced form. We compute a measure of dependence of an economy on imported inputs that is directly derived from the theoretical model and test the proposed mechanism in a gravity framework. As political relations and trade are possibly prone to endogeneity (i.e. political relations are likely to be affected by trade levels), we exploit an exogenous shock to political relations to test our prediction: the summoning or recalling of foreign or own diplomats, respectively. We construct a new event database by collecting information on these diplomatic events from press releases found on the websites of the foreign ministries of five politically and economically important countries (France, UK, Russia, Germany, Japan). Using these events as a proxy for a negative shock to bilateral political relations, we

³We follow Ossa (2015) in the wording, who states that “[...] imports in some industries are critical to the functioning of the economy, so that a complete shutdown of international trade is very costly overall” (Ossa, 2015, p. 266).

⁴Note that we use “industry”, “good” and “product” interchangeably as in the model each industry produces one good and the data needed for the empirical analysis is only available at aggregated industry level. The concept holds for any level of aggregation.

estimate the heterogeneous impact with *monthly* UN Comtrade (United Nations Statistics Division, 2015) import data of these countries vis-à-vis the rest of the world from January 2010 to December 2014.

Results from the empirical exercise point to the conclusion that political relations indeed do matter in the choice of the sourcing partner for today's interdependent economies and, importantly, more so for critical products, i.e. those the importing economy is dependent on. This provides evidence for the mechanism proposed in the theoretical model: the more an economy is dependent on a certain imported input, the more bilateral political relations matter for the choice of the trading partner.

The chapter is related to an extensive literature on the connection between trade and political relations. A growing body of research is looking into the nexus of political relations between countries and their bilateral trade, as non-traditional determinants of trade have been recognized as a primary source in explaining the *dark matter* of trade cost (Head and Mayer, 2014). Head and Mayer (2013) acknowledge the role of political history, as colonial legacies, through common languages, legal systems or currencies, as well as past conflicts have been shown to have a lasting impact on bilateral trade. However, it seems questionable to reduce the influence of political determinants of trade flows to historical episodes and those of conflict and colonial legacy. For almost half a century the Cold War never once “got hot”, yet certainly constituted a major obstacle to trade and global economic integration.⁵ One strand of the literature investigates the influence of bilateral political relations on aggregate trade flows. These focus by and large on security-related issues, in particular inter- and intra-state conflict (Martin et al., 2008a,b, 2012), “hijacking” of shipments (Anderson and Marcouiller, 2002; Marcouiller, 2000), terrorism (Mirza and Verdier, 2008; de Sousa et al., 2009, 2010) and international piracy (Bensassi and Martínez-Zarzoso, 2012).

⁵See also Findlay and O'Rourke (2007) for the history of the connection between the pattern and evolution of trade and long-term economic and political development.

A number of works have furthermore pointed to the importance non-security-related political and societal features of the trading countries. Yu (2010) studies the impact of political (democratic) institutions in the gravity equation and Umana Dajud (2013) finds positive coefficients for similarity in foreign policy and political ideology of trading partners. Rose (2007) shows that diplomatic representation may foster trade: he estimates that each additional foreign mission increases exports by 6–10 %.

Some recent works point to the implications of changes in the political relations for trade flows: Michaels and Zhi (2010) estimate an 8 percent drop in bilateral trade in intermediate inputs between the US and France as a response to the French opposition to the Iraq war in 2003. Similarly, Yazigi (2014) reports a marked drop in exports and imports from civil war-ridden Syria to European countries, yet increases with allied Russia and Iran. Mityakov et al. (2012), emphasizing heterogeneity across sectors and the motivation of “energy security”, show that a one standard deviation decrease in political distance, as measured through similarity of UN General Assembly voting, is associated with a 14 percent decrease in US imports. Others find more mixed evidence: Nitsch (2007) shows that official visits of heads of states have on average a positive effect on export of an 8–10 % increase. However, these results are very sensitive to the type of visits and much less robust for imports. Fuchs and Klann (2013) estimate the effect of the foreign trips of the Dalai Lama on the host countries’ subsequent trade with China. They only find a significant effect for meetings with the countries’ top political leaders and only for the period of 2002-2008, while the effect also only lasts one year. Davis et al. (2012) estimate the effect of political relations on imports and exports of state-owned enterprises (SOE). Here the idea is that governments directly influence the firms’ behavior, implying a heterogeneity in the effect. Adverse bilateral political events are indeed found to lead to a reduction in imports and exports. As hypothesized, the relationship is stronger for imports by SOEs, but yields mixed results for exports.

The literature acknowledges that political relations have an effect on trade. Yet, little is known about the mechanisms at play as most of the analyses have focused on aggregate flows. We complement the existing literature by suggesting a channel through which political relations affect trade. We hypothesize that political relations matter more for critical goods. We test this prediction empirically by integrating an indicator for political relations and a new measure of economic dependence in a gravity framework at the industry-level.

A common point of concern in the literature is the estimation of the effects of political relations on trade in cross-section analyses and the connected issue of endogeneity. In response to this, a variety of different strategies have been employed to circumvent the endogeneity issue of political relations with economic outcomes. Kuziemko and Werker (2006) exploit the rotation of UN security council non-permanent membership to assess the connection between foreign aid and political support at international organizations. Romalis (2007), studying the effect of trade on growth, uses the trade policy of the United States as an instrument for the openness of developing countries. Fisman et al. (2014) take another approach and perform an event study, where they analyze the performance of Japanese and Chinese firms with exposure in the respective other market after nationalist episodes following the publication of a revisionist history textbook in Japan and a near-collision of a Chinese trawler with a Japanese coast guard vessel. To address the issue of endogeneity in our present case, we explore the effect on trade flows brought about by *exogenous* political shocks. We exploit the summoning or recalling of the ambassador (or other high-ranking members of the diplomatic staff) of a country as an exogenous negative shock to bilateral political relations to study how trade flows react.

The remainder of the chapter is organized as follows. In section 3.2 we develop a simple model to illustrate the proposed mechanism. In section

3.3 we compute a measure of dependence directly derived from the model. In section 3.4 we test the proposed mechanism using this measure in an event study. Section 3.5 concludes.

3.2 Theory

Most of the papers studying the connection between political relations and trade use aggregate trade flows.⁶ We claim that it is key to look at the effect of political relations at lower levels of aggregation, namely the industry or product level, as it is likely to be heterogeneous. Political relations could have a stronger impact on trade of particularly sensitive, critical inputs, i.e. inputs that the firms in the economy use intensively for final good production. The model presented in this section gives the intuitions as to why this may be so. The model is related to Acemoglu et al. (2012) in its depiction of input-output linkages in the context of the propagation of shocks.

We sketch a simple model in which a two-sector economy uses labor, domestic and imported foreign inputs. Political relations are assumed to affect variable trade costs. The price of a foreign input in the domestic market equals the price of the good in the foreign market multiplied by bilateral trade costs. An increase of political tensions translates into an increase of trade costs, which in turn leads to an increase of the price of the input.

Assuming political relations to enter as a variable trade cost is not new. They are widely considered to be a component of “dark” trade costs, i.e. costs that are difficult to measure, although they are clearly observed (Head and Mayer, 2013). In his theoretical framework, Yu (2010) models

⁶With the notable exception of Davis et al. (2012) who disaggregate by ownership structure, see above.

variable trade costs to explicitly depend on the level of democratization of the importing country. Mirza and Verdier (2008) include costs due to the threat of terrorism in a generic measure of transaction costs, arguing that terrorism threats create uncertainty and anxiety, which induce economic agents to become more aware about potential harm when conducting any transaction in the respective country. Umana Dajud (2013) measures political proximity as a variable element of the trade cost function.

Deriving the model, we show that a shock to the price of an input on which the economy is *dependent* has a greater impact on the production of goods consumed in the economy than a shock to other imported inputs. The intuition is the following: An increase in the price of an input decreases production of sectors proportionally to their use. This leads to an increase of the price of these goods. As these goods are used as intermediate inputs by other sectors, the shock is transmitted to other sectors. The production of the other sectors declines. The greater domestic input linkages, the greater is the decline. Therefore, the stronger direct and indirect use of imported foreign inputs, the more dependent is an economy on this input, the greater is the effect on aggregate output. Following this logic, political relations, entering the price of the imported inputs, should matter more for critical products, i.e. those the economy is dependent on.

3.2.1 Basic Setting

Assume a setting in which the domestic economy produces two goods, x and y . The production of good x requires labor l_x , domestic input y_x , and foreign inputs m_x and n_x . The production of good y analogously requires labor l_y , x_y , m_y and n_y . The production functions are of Cobb-Douglas

type such that

$$x = l_x^{\lambda_x} y_x^{\beta_x} m_x^{\gamma_x} n_x^{\delta_x} \quad (3.1)$$

$$y = l_y^{\lambda_y} x_y^{\alpha_y} m_y^{\gamma_y} n_y^{\delta_y} \quad (3.2)$$

$$\text{where } \lambda_x + \beta_x + \gamma_x + \delta_x = \lambda_y + \alpha_y + \gamma_y + \delta_y = 1$$

The exponents in equations (3.1) and (3.2) denote the respective technical coefficients. The total production of a good produced domestically can be either used as input in the other sector or consumed, such that $x = x_y + x_c$ and $y = y_x + y_c$. Foreign goods are only used as inputs in the domestic economy, such that $m = m_x + m_y$ and $n = n_x + n_y$. Let p_x , p_y , p_m , and p_n denote the price of the respective good. Labor is mobile and thus the wage w is equal in both sectors.

The representative consumer in the domestic economy has a Cobb-Douglas utility of the form $U = x_c^\eta y_c^{1-\eta}$. The consumer disposes over 1 unit of labor such that she receives an income of w and hence maximizes her utility under the budget constraint $p_x x_c + p_y y_c = w$. As a result, the representative consumer spends a share η of her revenue on x and the rest on y . We thus have $x_c = \eta \frac{w}{p_x}$ and $y_c = (1 - \eta) \frac{w}{p_y}$.

The production function being of Cobb-Douglas type, the model does not allow for a change in production technologies or a substitution between foreign and domestic inputs. Given that our analysis focuses on short-term effects of a shock, it is a reasonable assumption. In the short-run, production technology cannot adjust. Furthermore, it is important to stress that the framework aims at putting the emphasis on one channel and properly identifying the mechanisms at play. Other potential channels are ruled out of the analysis. More precisely, there is no such thing as a competition channel, as there are no imported final goods. Hence, there is also no decrease or increase of the competition on the final goods market after a shock to political relations. Furthermore, there is no market access chan-

nel as there are no exports of final goods. Hence, there is also no change in the access to a foreign market for domestic final goods producers.

Coming back to the model, in each sector the representative firm maximizes profits. In sector x we have

$$\pi_x = p_x x - w l_x - p_y y_x - p_m m_x - p_n n_x.$$

which yields

$$\begin{aligned} w l_x &= p_x x \lambda_x \\ p_y y_x &= p_x x \beta_x \\ p_m m_x &= p_x x \gamma_x \\ p_n n_x &= p_x x \delta_x \end{aligned}$$

while the analogous optimization for the firm in sector y yields

$$\begin{aligned} w l_y &= p_y y \lambda_y \\ p_x x_y &= p_y y \alpha_y \\ p_m m_y &= p_y y \gamma_y \\ p_n n_y &= p_y y \delta_y \end{aligned}$$

Rearranging, the total amounts of the goods in the economy are therefore governed by

$$\begin{aligned} x &= \frac{p_y}{p_x} \alpha_y y + x_c \\ y &= \frac{p_x}{p_y} \beta_x x + y_c \\ m &= \frac{p_x}{p_m} \gamma_x x + \frac{p_y}{p_m} \gamma_y y \\ n &= \frac{p_x}{p_n} \delta_x x + \frac{p_y}{p_n} \delta_y y \end{aligned}$$

which, expressed in matrix form is

$$\begin{pmatrix} x \\ y \\ m \\ n \end{pmatrix} = \begin{pmatrix} 0 & \frac{p_y}{p_x}\alpha_y & 0 & 0 \\ \frac{p_x}{p_y}\beta_x & 0 & 0 & 0 \\ \frac{p_x}{p_m}\gamma_x & \frac{p_y}{p_m}\gamma_y & 0 & 0 \\ \frac{p_x}{p_n}\delta_x & \frac{p_y}{p_n}\delta_y & 0 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \\ m \\ n \end{pmatrix} + \begin{pmatrix} x_c \\ y_c \\ 0 \\ 0 \end{pmatrix}$$

At this point the resemblance to the Leontief matrix becomes clear, so that the unit output for the goods in the economy can simply be retrieved by inverting, so that

$$\begin{pmatrix} x \\ y \\ m \\ n \end{pmatrix} = \frac{1}{1 - \alpha_y\beta_x} \begin{pmatrix} 1 & & & & \frac{p_y}{p_x}\alpha_y & & 0 & 0 \\ & \frac{p_x}{p_y}\beta_x & & & 1 & & 0 & 0 \\ \frac{p_x}{p_m}\gamma_x + \frac{p_x}{p_y}\beta_x\frac{p_y}{p_m}\gamma_y & & & & \frac{p_y}{p_m}\gamma_y + \frac{p_y}{p_x}\alpha_y\frac{p_x}{p_m}\gamma_x & & 1 & 0 \\ \frac{p_x}{p_n}\delta_x + \frac{p_x}{p_y}\beta_x\frac{p_y}{p_n}\delta_y & & & & \frac{p_y}{p_n}\delta_y + \frac{p_y}{p_x}\alpha_y\frac{p_x}{p_n}\delta_x & & 0 & 1 \end{pmatrix} \begin{pmatrix} x_c \\ y_c \\ 0 \\ 0 \end{pmatrix}$$

Focusing on imported inputs m and n , we have

$$\begin{pmatrix} m \\ n \end{pmatrix} = \frac{1}{1 - \alpha_y\beta_x} \begin{pmatrix} \frac{p_x}{p_m}(\gamma_x + \beta_x\gamma_y) & \frac{p_y}{p_m}(\gamma_y + \alpha_y\gamma_x) \\ \frac{p_x}{p_n}(\delta_x + \beta_x\delta_y) & \frac{p_y}{p_n}(\delta_y + \alpha_y\delta_x) \end{pmatrix} \begin{pmatrix} x_c \\ y_c \end{pmatrix} \quad (3.3)$$

The domestic economy is considered as being more dependent on input m than on input n , i.e. needs it more for final consumption, if and only if

$$x_c \frac{p_x}{p_m}(\gamma_x + \beta_x\gamma_y) + y_c \frac{p_y}{p_m}(\gamma_y + \alpha_y\gamma_x) > x_c \frac{p_x}{p_n}(\delta_x + \beta_x\delta_y) + y_c \frac{p_y}{p_n}(\delta_y + \alpha_y\delta_x)$$

Hence, this measure of *dependence* is a weighted mean of each sector's dependence to an input; each sector's dependence is a function of direct use of the input and indirect input use which depends on domestic cross-sectoral linkages.

Using the fact that $\beta_x + \gamma_x + \delta_x = 1$ and $\alpha_y + \gamma_y + \delta_y = 1$, the condition is equivalent to

$$x_c p_x(\gamma_x + \beta_x\gamma_y) + y_c p_y(\gamma_y + \alpha_y\gamma_x) > \frac{p_m(1 - \beta_x\alpha_y)}{p_n + p_m}$$

From the consumer maximization problem we have $x_c = \eta \frac{w}{p_x}$ and $y_c = (1 - \eta) \frac{w}{p_y}$. The condition can then be rewritten as

$$\eta(\gamma_x + \beta_x \gamma_y) + (1 - \eta)(\gamma_y + \alpha_y \gamma_x) > \frac{p_m(1 - \beta_x \alpha_y)}{p_n + p_m}$$

3.2.2 Impact of a Change in Political Relations

In this stylized two-sector setting with imported inputs, we analyze the effect of a change in political relations to aggregate output. We compare the effect of a shock to political relations between the domestic economy and the country that provides m with the same shock between the domestic economy and the country that provides n .

Following the existing literature, we hypothesize political relations to affect variable trade costs. The simplest way to model trade cost is assuming so-called iceberg trade costs. The price of a foreign input m sourced from i in the domestic market can then be described by $p_m = \tau^i \cdot p_m^i$ where p_m denotes the price of m in the domestic market, p_m^i the price of m in i and τ^i trade cost between the domestic economy and i . Similarly, the price of a foreign input n sourced from j in the domestic market is $p_n = \tau^j \cdot p_n^j$. A shock to political relation is modeled as a shock to τ , which leads to a shock to the price of the input.

We now study the effect of an increase in p_m due to a shock on τ . Focusing on sector x , from the firm profit maximisation problem in sector x we know that the demand for input m in x is

$$m_x = \frac{p_x x \gamma_x}{p_m}$$

Taking the derivative with respect to p_m , we have

$$\frac{\partial m_x}{\partial p_m} = -\frac{m_x}{p_m}$$

Hence, when the price of m increases, the demand for m in x decreases. Given the Cobb-Douglas production function, this leads to a decrease in the output of x

$$\begin{aligned}\frac{\partial x}{\partial p_m} &= \gamma_x l_x^{\lambda_x} y_x^{\beta_x} m_x^{\gamma_x-1} n_x^{\delta_x} \frac{\partial m_x}{\partial p_m} \\ &= -\frac{\gamma_x}{p_m} x\end{aligned}$$

This is the *direct* effect of an increase in the price of m on x . As x decreases, the price of x increases. From the firm profit maximization in x we have

$$p_x = \frac{w l_x}{x \lambda_x}$$

Taking the derivative with respect to x

$$\frac{\partial p_x}{\partial x} = -\frac{p_x}{x}$$

As x is used as an input by y , the change in the price of x has an effect on production of y . From the firm profit maximization in y we have that

$$x_y = \frac{p_y y \alpha_y}{p_x}$$

Taking the derivative with respect to p_x yields

$$\frac{\partial x_y}{\partial p_x} = -\frac{x_y}{p_x}$$

When p_x increases, x_y decreases. This leads to a decrease in y indirectly

$$\begin{aligned}\frac{\partial y}{\partial p_x} &= \alpha_y l_y^{\lambda_y} x_y^{\alpha_y-1} m_y^{\gamma_y} n_y^{\delta_y} \frac{\partial x_y}{\partial p_x} \\ &= -\frac{\alpha_y}{p_x} y\end{aligned}$$

The increase in the price of m therefore has a *direct* effect on the production of x that is governed by its technical coefficient γ_x and an additional *indirect* effect on the production of y through domestic linkages by way of the technical coefficient α_y .

Symmetrically, the increase in price of m has a direct effect on sector y and an indirect effect on sector x . The total effect of a change in the price of m on the production of each sector is the sum of the direct and indirect effect. The effect of a change of the price of m on sector x therefore is

$$\begin{aligned}\text{TE}_x^m &= -\frac{1}{p_m}\gamma_x x + \frac{\partial x}{\partial p_y} \frac{\partial p_y}{\partial y} \frac{\partial y}{\partial p_m} \\ &= -\frac{1}{p_m}(\gamma_x + \beta_x \gamma_y)x\end{aligned}$$

The effect of a change of the price of m on sector y is

$$\begin{aligned}\text{TE}_y^m &= -\frac{1}{p_m}\gamma_y y + \frac{\partial y}{\partial p_x} \frac{\partial p_x}{\partial x} \frac{\partial x}{\partial p_m} \\ &= -\frac{1}{p_m}(\gamma_y + \alpha_y \gamma_x)y\end{aligned}$$

We can calculate the total effect of a change of the price of n on both sectors using the same reasoning. The total effect of a change of the price of n on sector x is

$$\begin{aligned}\text{TE}_x^n &= -\frac{1}{p_n}\delta_x x + \frac{\partial x}{\partial p_y} \frac{\partial p_y}{\partial y} \frac{\partial y}{\partial p_n} \\ &= -\frac{1}{p_n}(\delta_x + \beta_x \delta_y)x\end{aligned}$$

The total effect of a change of the price of n on sector y is

$$\begin{aligned}\text{TE}_y^n &= -\frac{1}{p_n}\delta_y y + \frac{\partial y}{\partial p_x} \frac{\partial p_x}{\partial x} \frac{\partial x}{\partial p_n} \\ &= -\frac{1}{p_n}(\delta_y + \alpha_y \delta_x)y\end{aligned}$$

We define aggregate output (AO) as $AO = x^\eta y^{1-\eta}$. The total effect of a change of the price of m on $\log(\text{AO})$ is

$$\begin{aligned}\frac{\partial \log(\text{AO})}{\partial p_m} &= \eta \frac{\partial \ln(x)}{\partial p_m} + (1 - \eta) \frac{\partial \ln(y)}{\partial p_m} \\ &= \frac{\eta}{x} \frac{\partial x}{\partial p_m} + \frac{1 - \eta}{y} \frac{\partial y}{\partial p_m} \\ &= -\left[\eta \frac{1}{p_m} (\gamma_x + \beta_x \gamma_y) + (1 - \eta) \frac{1}{p_m} (\gamma_y + \alpha_y \gamma_x)\right]\end{aligned}$$

Similarly, the total effect of a change of the price of n on $\log(\text{AO})$ is

$$\frac{\partial \log(\text{AO})}{\partial p_n} = -\left[\eta \frac{1}{p_n} (\delta_x + \beta_x \delta_y) + (1 - \eta) \frac{1}{p_n} (\delta_y + \alpha_y \delta_x)\right]$$

The effect on aggregate output of a change in p_m is greater than the effect of a change in p_n if and only if

$$\left| \frac{\partial \log(\text{AO})}{\partial p_m} \right| > \left| \frac{\partial \log(\text{AO})}{\partial p_n} \right|$$

which can be shown to be equivalent to

$$\eta(\gamma_x + \beta_x \gamma_y) + (1 - \eta)(\gamma_y + \alpha_y \gamma_x) > \frac{p_m(1 - \beta_x \alpha_y)}{p_n + p_m}$$

Previously we show that this condition is true if and only if the domestic economy is more dependent on m than on n . Hence, aggregate output is more affected by change in p_m than by a change in p_n , if it is more dependent on m than on n .

Our model extends on the existing literature on the impact of political factors on trade flows by illustrating that an increase in political tensions has a greater impact on total output when it affects the imports of critical inputs. The impact of a change in prices, as a consequence of a change in political relations and transmitted by a change in bilateral trade costs, on total output and by extension to consumer utility is more severe for these products. Therefore a government, charged with securing the welfare

of its citizens, would opt to rely on politically friendly partners for these critical inputs, or swiftly switch to more favorable ones in case of sudden cooling of political relations. To boil the model's prediction down to its implied mechanism on trade flows: The more critical an imported input is for the economy of a given country, the more sensitive its imports are with respect to political relations. Before testing this prediction in section 3.4 in a reduced form setting, we introduce the measure of dependence, which we use to identify critical products.

3.3 Measure of Dependence

The measure of dependence of a country on imported inputs can be derived directly from the concept of *dependence* from section 3.2 and constructed using data from input-output tables. Following equation (3.3), we know that

$$\begin{pmatrix} m \\ n \end{pmatrix} = \frac{1}{1 - \alpha_y \beta_x} \begin{pmatrix} \frac{p_x}{p_m} (\gamma_x + \beta_x \gamma_y) & \frac{p_y}{p_m} (\gamma_y + \alpha_y \gamma_x) \\ \frac{p_x}{p_n} (\delta_x + \beta_x \delta_y) & \frac{p_y}{p_n} (\delta_y + \alpha_y \delta_x) \end{pmatrix} \begin{pmatrix} x_c \\ y_c \end{pmatrix}$$

Normalizing by the total consumption of the economy and expressed in matrix form, we call the vector

$$\text{dependence}_j = A_m (I - A_d)^{-1} F \quad (3.4)$$

where A_m is the matrix of the values of *imported* inputs by sector and A_d the matrix of the values of *domestic* inputs by sector. F is the vector of final consumption shares. The interpretation of the vector is straightforward: each element denotes the required value of foreign input of the respective commodity for 1 unit value of final consumption in the economy j . The higher the necessary imported value, the more dependent the country is on the input. The concept is related to those developed by the flourishing literature on value-added trade.⁷ Here one of the key concept is the “im-

⁷See e.g. Johnson and Noguera (2012).

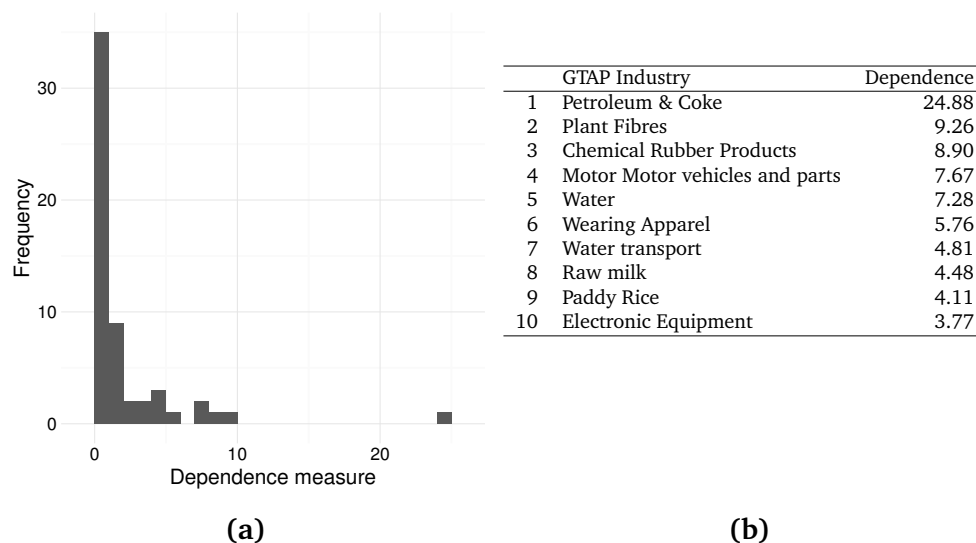


Figure 3.1: Histogram of dependence measure (a) and top 10 US critical industries (b) as imported value by industry per 1000 USD GDP

port content of exports”, i.e. the share of foreign value-added in a given domestic industry. The angle of analysis of our measure is different as it focuses on the input rather than on the final product. We are interested in how much an imported input matters for final consumption, directly and indirectly.

Note that by construction of the measure the technology is assumed not to change in face of a price shock. This ad-hoc assumption should not be problematic in the current context as the adjustment of technology can safely be assumed to take considerable time. Furthermore, the implications for this *dynamic* effect on the economy are ambiguous. On the one hand, a technology adjustment would mitigate price shocks to some degree. On the other hand, an adjustment would likely be costly and only pay off over the longer term. As our following empirical analysis focuses on rather short-run effects using monthly data, we believe the assumption is reasonable.

To get an idea of the veracity of the measure, we compute the measure for the United States using input-output tables from the Bureau of Economic

Analysis with data on 389 industries. The results are displayed in table C.1. The ranking and magnitude appear to be sensible, with petroleum, manufacturing and electronic inputs dominating the top ranks. Unfortunately input-output tables of this high detail are a rarity. For the empirical analysis to follow in section 3.4 we opt to use data from GTAP (Aguiar et al., 2012)⁸, commonly used in the related literature on global value chains, most notably by Johnson and Noguera (2012) and Timmer et al. (2012). While the data only has a level of disaggregation of 47 industries, their broad country coverage makes it very appealing. The dataset covers 129 regions, and the tables are globally consistent and cleaned of irregularities. Figure 3.1a shows the histogram and table 3.1b displays the ranking of the most critical products for the United States, i.e. those it is dependent on. A comparison with the more detailed results from table C.1 shows consistent figures by ranking and magnitude across different levels of aggregation of the used input-output tables.

3.4 Event Study

Having computed the measure of dependence by country and industry, we now test the prediction of the model from section 3.2. We follow Fuchs and Klann (2013) and perform an event study embedded in a gravity model of international trade. The theory above suggests that those inputs on which a country is *dependent* are more sensitive to political relations than others. As the identification of the effect of political relations on trade flows is prone to endogeneity issues, we explore its effect brought about by *exogenous* political shocks. Here, we exploit the summoning and recalling of a high-level diplomat of a country, i.e. the ambassador or another member of the permanent diplomatic staff, as an exogenous negative shock to bilateral political relations in order to study how trade flows react using monthly trade data for five major importers from 2010 to 2014.

⁸GTAP 8 data is for 2007. It ensures exogeneity of input coefficients for the event study.

We follow the gravity literature and assume a generic structural gravity estimation,⁹ such that the trade flow X_{odkt} from origin o to destination d of product k at time t is governed by

$$X_{odkt} = \frac{Y_{okt}}{\Omega_{okt}} \cdot \frac{X_{dkt}}{\Phi_{dtk}} \cdot \tau_{odkt} \quad (3.5)$$

where $Y_{okt} = \sum_{dkt} X_{odkt}$ is the value of production of k in o at time t and $X_{dkt} = \sum_{okt} X_{odkt}$ is the value of expenditure on k in d at time t . Ω_{okt} and Φ_{dtk} are the respective outward and inward multilateral resistance terms. As discussed above, we assume political relations to enter variable trade costs. τ_{odkt} is hence assumed to take the form of

$$\tau_{odkt} = \exp(\text{Controls}_{odkm} + \delta \cdot \text{PoliticalRelations}_{odt})$$

We allow other components of trade costs to vary by calendar month in order to account for seasonality in the context of monthly trade flow data. We now turn to the measure of political relations, or rather the exogenous shock hereto, before estimating its impact on trade flows.

3.4.1 Data on Diplomatic Events

Summoning or recalling high-level diplomats is used as a diplomatic instrument to put pressure on a foreign government. They are considered after mediation, negotiation and arbitration fails. We believe these events make for a reasonable proxy for an adverse shock to bilateral political relations. The summoning, recalling or expulsion of diplomats is a decision taken by the foreign office or the head of state of a country to exert diplomatic pressure on another country. It often goes along with a *note verbale* or *letter of protest*, a formal declaration of disapproval that occurs at that date and is specific to a country pair. This declaration, as opposed to news reports, is

⁹See Head and Mayer (2014) for a review of the state of the art of gravity equations.

an official statement by the government. We can distinguish between two directions of actions. The one direction is the summoning of a diplomat of a foreign country in the home country. In the extreme case, the protest yields the (temporary) expulsion of the ambassador and the diplomatic staff, or even the closure of the embassy in the home country. In this case, it is often the sign of a strong concern from the home country towards the foreign country. In the other direction, a country can recall its own ambassador or the entire diplomatic staff from a foreign country. In the extreme, this action yields a temporary closure of the embassy in the foreign country.

In general, the endogeneity of trade and political relations is an obvious identification issue. One might reasonably raise the concern that any government will try to keep its own economy afloat for the sake of popularity and therefore by all means aim to maintain a positive level of bilateral political relations with important trading partners. However, we suspect that this is more prevalent for small countries. We hypothesize that bigger countries exercise their political power regardless of trade ties, whose diplomatic events would therefore be exogenous.

As stated by Rozental and Buenrostro (2013) in their chapter in the Oxford Handbook of Modern Diplomacy, “a state aspiring to adopt a global leadership role—such as any one permanent member of the United Nations Security Council—has to maintain ties with almost all countries and regions, while middle and smaller powers must prioritize their objectives and diplomatic resource”. While governments of “small” countries may thus hesitate to exercise this tool of foreign policy—it could be costly in both political and economic terms—“big” countries are much less constrained in their policy making. They summon and recall diplomats of any country—not only from “small” trading partners but from major ones as well.¹⁰

¹⁰For instance, in one recent case in June 2015, the media extensively reported about the summoning of the American ambassador in Paris by the French government over “unacceptable spying on French political leaders”. See

We therefore focus our analysis on the actions taken by the countries of Germany, France, United Kingdom, Japan and the Russian Federation, as they are lead actors in the political arena as well as in trade, combining roughly 25 % of world imports between them.¹¹ The selected five countries have repeatedly made use of summoning or recalling of an ambassador as a foreign policy tool. We have collected information on these events from official press releases available on the website of each Ministry of Foreign Affairs,¹² using keyword searches such as “ambassador summoned”, “ambassador recalled”, “withdraw of diplomatic staff”, “embassy closure”. A complete list of events can be found in table C.2 in the appendix.¹³

To confirm the exogeneity of our events to trade levels, we analyze the link between the probability of having an event for a given country pair (i.e. summoning or recalling of an ambassador of country o by country d) and bilateral aggregate trade at the beginning of the period studied. To identify a country pair for which an event occurred over the studied period, we construct a dummy variable that equals 1 if an event occurred at least once during the period 2010–2014.

We first perform a simple mean test by splitting the sample of country pairs between two groups: the first one being country pairs with a dummy variable equal to one; the second one being the rest. We test if the average trade share (share of a given partner in import flows) in 2010 is significantly different for the two groups. Results presented in Table 3.1 show that country pairs with an event trade significantly more than other country pairs. This rejects the hypothesis that our five importers are less

The Guardian, 24 June 2015, <http://www.theguardian.com/world/2015/jun/24/francois-hollande-says-us-spying-on-french-officials-unacceptable-nsa>.

¹¹Three of the five countries—France, the United Kingdom and the Russian Federation—are permanent members of the UN Security Council.

¹²Appendix C.2.1 lists the direct weblinks to the different websites.

¹³Notably absent from the list of countries are the United States, whose foreign policy clearly shapes global events and likely influences trade flows. Unfortunately, however, the State Department does not make public instances in which these instrument of diplomacy are used.

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	461	0.66	.09	1.90	0.49	0.84
1	43	1.31	0.58	3.80	0.14	2.48
combined	504	0.72	0.10	2.14	0.53	0.90
diff		-0.65	0.33		-1.32	0.02
<i>diff = mean(0) - mean(1)</i>				<i>t = -1.91</i>		
<i>Ho : diff = 0</i>				degrees of freedom = 502		
<i>Ha : diff < 0</i>		<i>Ha : diff ≠ 0</i>		<i>Ho : diff < 0</i>		
<i>Pr(T < t) = 0.0278</i>		<i>Pr(T > t) = 0.0557</i>		<i>Pr(T > t) = 0.9722</i>		

Table 3.1: Mean test on trade share for two groups (treated/non-treated)

VARIABLES	Probability of an event occurring
share of imports	0.05 (0.03)
Constant	-1.41*** (0.085)
Observations	504
Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.	

Table 3.2: Probit Test for exogeneity

likely to summon ambassadors from important trade partners. One might worry that this biases our estimates. However, as the effect of trade on tensions is positive, if anything, our coefficient is an underestimation of the true coefficient.

As a second test, we regress the probability of an event occurring for a given country pair on import shares in 2010. The results are shown in table 3.2. The findings of the mean test are confirmed; there is a positive but not statistically significant relation between trade and the probability of an event occurring.

3.4.2 Data on Monthly Trade Flows

Given the characteristics of our events we expect a short-term impact on trade flows, similar to the observed effect of Dalai Lama visits in Fuchs and Klann (2013).¹⁴ In consequence, we opt for an analysis using data with monthly trade flows. Unfortunately monthly trade data has only in recent years seen more widespread availability. The most prominent (and free to access) is UN Monthly Comtrade (United Nations Statistics Division, 2015). For the purpose of this study, we extract data on the imports of France, UK, Russia, Germany, Japan vis-à-vis the rest of the world—241 countries and territories—from January 2010 to December 2014, totaling 60 months. We aggregate trade flows to the GTAP industry level. Using monthly data however also poses new issues, seasonality being one. We account for this by including exporter \times importer \times month fixed effects in all our regressions.

3.4.3 Estimation Strategy

As in a regular difference-in-differences approach, the idea is to compare trade flows before and after the event for countries which experience a shock in political relations relative to other country pairs.¹⁵ The use of the gravity framework allows us to control for various sets of fixed effects and the estimated coefficients can be interpreted as the average partial effects in terms of a percentage change of imports. The inclusion of fixed effects improves upon the gravity specification of Fuchs and Klann (2013), who estimate a “naive” gravity equation with GDP data. The shock is constructed as a dummy variable, *Treatment*, that is time and country pair-specific. It is equal to 1 for a given country pair after it experienced an

¹⁴It is also likely to have a much less severe impact than military conflicts or more structural security issues like domestic political instability (Martin et al., 2008a,b, 2012).

¹⁵As there is a small number of country pairs that do not entertain bilateral diplomatic representations, e.g. North Korea and France do not have official diplomatic relations, we only consider country pairs that do have embassies or consulates in one another in the analysis.

event detailed above. As we expect a heterogeneous effect at the industry level, we additionally interact the treatment variable, i.e. the shock to political relations, with our measure of dependence. We therefore estimate equation (3.5) as

$$\begin{aligned} \log(X_{odkt}) = & F_{okt} + F_{dkt} + F_{odkm} + \delta_0 \cdot \text{Treatment}_{odt} \\ & + \delta_1 \cdot \text{Treatment}_{odt} \times \log(\text{Dependence}_{dk}) + \epsilon_{odkt} \end{aligned} \quad (3.6)$$

where F_{okt} and F_{dkt} capture all exporter \times industry \times time and importer \times industry \times time characteristics. We let the bilateral fixed effect F_{odkm} vary by (calendar-) month to account for seasonality. Standard errors are clustered at the exporter \times importer \times industry \times month level. We expect the coefficient for the treatment, δ_0 , and for the interaction term with $\log(\text{Dependence})$, δ_1 , to be negative. Trade after the adverse political shock should decrease for the treated countries relative to other country pairs, and even more so for critical products. Note that in the current setup δ_0 reflects the *maximum* impact, i.e. the change in imports following the shock for a good with a dependence value of 1, as the second term is set to $\log(1) = 0$.

3.4.4 Results

The results are presented in table 3.3. A sudden shock to bilateral political relations negatively impacts trade between two countries, with a stronger effect for imports in critical products. Columns (1) and (2) report the coefficients using imports from all 241 countries with different sets of fixed effects. While the point estimates go in the same direction, the results become insignificant when including country \times industry \times date and country pair \times industry \times month fixed effects (as opposed to country \times date, country \times industry and country pair \times industry \times month fixed effects). It is likely due to the composition of countries that includes numerous small countries and territories whose exports in different industries are very granular. In turn, this leads to the fixed effects purging most of the varia-

	Dependent variable:				
	log(imports)				
	(1)	(2)	(3)	(4)	(5)
Treatment	-0.127** (0.051)	-0.085 (0.085)	-0.171*** (0.057)	-0.165** (0.079)	-0.152* (0.088)
Treatment x log(Dependence)	-0.019*** (0.007)	-0.012 (0.011)	-0.024*** (0.008)	-0.022** (0.011)	-0.023* (0.012)
Fixed effects	ctry-dt,ctry-ind, pair-ind-mo	ctry-ind-dt, pair-ind-mo	ctry-dt,ctry-ind, pair-ind-mo	ctry-ind-dt, pair-ind-mo	ctry-ind-dt, pair-ind-mo
Sample	all	all	Top 50	Top 50	w/o Arab league
Observations	457,344	457,344	252,321	252,321	405,701
R ²	0.890	0.966	0.904	0.967	0.968
Adjusted R ²	0.883	0.887	0.900	0.913	0.894

Notes: Robust standard errors in parentheses are clustered by exporter \times importer \times month \times industry. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 3.3: Event study with industry-level flows

tion. This suspicion is supported by results of estimating equation (3.6) with data from only the biggest 50 exporters in terms of total trade over the whole period. Columns (3) and (4) report the respective coefficients for the same two sets of fixed effects: the coefficients are very similar in magnitude and highly significant throughout. A look at the number of observations underlines the previous lead: Although the number of exporting countries is reduced by 80 percent, the number of observations drops by only 45 percent. The share of zero flows at the industry level is therefore as expected higher for smaller exporters. At the same time, the number of treated country pairs drops from 47 to 27.

A concern could be that the results are driven by the events occurring in connection with the so-called Arab spring, which falls right into the time window of the data we use. The summoning of the respective Ambassadors was relatively common, resulting in 31 such recorded instances.¹⁶ The events coincided with security crises in these countries that could equally cause a sharp decline in imports, driving the reported results. We therefore re-run the estimation of equation (3.6) on only non-Arab league countries. We find that this concern is not merited, yielding almost identical results (column 5).

¹⁶See appendix C.2.2 for the list of events.

In terms of magnitude, the results are consistent throughout all specifications. Taking the coefficients of our preferred specification, column (4), at the mean (log-)dependence ($= 0.00108$) the shock leads to a $(1 - \exp(-0.164 - 0.022 \cdot \log(0.00108))) \cdot 100 = 1.46\%$ drop in imports. While this average effect may economically not be overwhelming, the average affect of a more critical product like oil stands at 3.71%. As a robustness test (and disregarding potential endogeneity issues) we also include the dependence measure in a “plain vanilla” gravity framework with annual trade data from 1980 to 2010 and interact it with the measure of political relations from chapter 1. The results confirm the outcome of the event study (see appendix C.3).

Overall, the results underline the heterogeneous response of industries to political shocks, as measured by the dependence of the country on critical inputs. The more critical an imported input is for the economy of a given country, the more sensitive its imports are with respect to political relations. As laid out in the model in section 3.2, the impact of a change in prices on total output and consumer utility, as a consequence of an abrupt change in political relations and transmitted by a change in bilateral trade costs, is more severe for these products. Therefore a government, charged with securing the welfare of its citizens, would opt to rely on politically friendly partners for these critical inputs, or swiftly switch to more favorable ones in case of sudden cooling of political relations. The results resonate with the existing literature and emphasize an explicit mechanism, the concept of critical inputs, through which political relations impact trade flows as a component of bilateral trade costs.

3.5 Conclusion

In this chapter we extend the literature on the link between politics and trade by suggesting a mechanism through which political relations affect the exchange of goods. Most of the previous studies look at the impact of the deterioration or improvement of bilateral political relations on aggregate flows. Our contribution is to extend the existing body of research by exposing the heterogeneity of the impact by product/industry. Estimations on aggregate trade flows are hiding important characteristics of the effect that become visible at lower levels of aggregation. Our hypothesis is that imports of critical products, those on which the importing economy is very dependent on, are affected much more gravely than others. Countries are dependent on certain products that contribute directly and indirectly through input-output linkage relatively more to total output than other inputs.

We sketch a simple model that illustrates the mechanism at play by building on existing models of economic shock propagation. The model predicts that price shocks on imported inputs that—through direct and indirect use by way of domestic linkages—contribute to total production relatively more than others, have a stronger adverse effect. The model allows us to derive a measure of dependence of an economy on certain products/industries that can be taken directly to the data.

We compute this measure of dependence for 129 countries and 47 industries using data from GTAP 8. We then conduct an event study that exploits abrupt and unanticipated political shocks to test the proposed mechanism: the recalling and summoning of high-level diplomats. After testing for exogeneity of the events the econometric results support the hypothesis of a heterogeneous impact of political relations on imported inputs, driven by the country's dependence on them.

Our study contributes to a growing literature that aims to shed light on the “dark” trade costs, those that can be observed but are difficult to quantify. The proposed mechanism supports the hypothesis that the impact of political relations—a component of dark trade costs that has been highlighted before—is heterogeneous and conditional on a country’s dependence on certain inputs. At the same time, the mechanism clearly only tells part of the story. As it is well known that firms are not homogeneous either, we wonder about their role and influence in the “great game” of international relations. With growing influence of multinationals, they have grown from spectators to actors. As intriguing as these topics are, we refer them to future research.

4

The View From Space: Theory-based Time-varying Distances in the Gravity Model¹

4.1 Introduction

When concerned with the determinants of the volume of flows of goods, trade economists often have to resort to aggregate trade figures, by country, or sometimes state and province, making an aggregation of its determinants equally necessary. This chapter, building on earlier work by Head and Mayer (2009), sets out to provide an aggregation of trade costs that is derived from a very general representation of the gravity equation, while remaining agnostic to its micro-foundation. I apply the method to compute time-varying distances using nighttime satellite imagery. Using these theory-consistent distances, the elasticity of trade with respect to distance can be estimated in the within-dimension of a panel, allowing to control

¹I thank Matthieu Crozet, Lionel Fontagné and Thierry Mayer for very helpful comments. This chapter has greatly benefited from discussions with Keith Head during a research stay at the Sauder School of Business at the University of British Columbia. I further thank the participants of the UBC Trade Group Seminar, ETSG 2015, LMU IO and Trade Seminar, 8th FIW Research Conference 'International Economics', Warwick PhD Conference, EGIT 2016 and RIEF 2016 for valuable suggestions.

for time-invariant unobserved country pair characteristics. Further, the use of these distances produces the noteworthy results of significantly lower estimates of coefficients for variables that are correlated with distance. Most notable is an up to 50 % decrease in the estimated effect of borders on trade, i.e. the net cost of crossing a border.

In its earliest and simplest form, Tinbergen et al. (1962) described the volume of trade flows between countries as a function of the size of the two economies and their distance, borrowing an analogy from physics that has since named the relation: Gravity. While the theoretical underpinnings of gravity of international trade have since received drastic improvements with Anderson (1979), Anderson and van Wincoop (2003) and others, the employed distance measures have seen surprisingly little attention.

The initial ad-hoc choice for bilateral country distances was the so-called *great circle distance* between the capitals or large cities of the respective countries. Helliwell and Verdier (2001) and Head and Mayer (2009) first noted the choice's possible influence on other gravity variables, showing that a mismeasurement, particularly that of the internal distance of a country, could have an impact on the estimated border effect. Mayer and Zignago (2011) then computed and made publicly available the current de-facto standard of bilateral and internal country distances, an arithmetic mean of great circle distances between population centers, weighted by time-invariant data on city sizes. The contribution of this chapter is to improve the existing measures along multiple lines. First, I derive a trade cost aggregation that is agnostic to the underlying gravity framework, but yields concrete instructions on the method of computation and data to be used; Second, I turn to satellite imagery that provides information on exact location and intensity of *economic activity*, whether urban or rural region. This eliminates the possibility of measurement error in human-collected population figures and drastically increases the coverage to virtually all inhabited and economically active areas in very fine detail. Furthermore it

moves away from a population-weighted measure towards a GDP-based measure, which is more consistent with the theoretical gravity frameworks. Third, the used data has an annual periodicity, allowing me to compute a time series of distances for each country pair and year since 1992.

This chapter yields two important results. In the theoretical part I show that the estimated trade cost coefficient from a gravity equation serves also as a parameter in the respective trade cost aggregation itself. In the empirical part I then estimate the distance coefficient iteratively while, exploiting the data's time-variation, controlling for unobserved country-pair characteristics. The preferred distance elasticity estimate is in the vicinity of -1, in line with traditional results found in the gravity model literature.² The estimated coefficient calls for the use of harmonic mean distances, as opposed to the customary use of arithmetic mean distances. This in turn yields the second important, empirical, result of the chapter. Using harmonic mean distances has consequences on the estimated coefficients of other distance-correlated gravity variables. The border effect, i.e. the often puzzlingly large relative difference between internal and external trade, is reduced by up to 63 %. Additionally the coefficient on trade with a directly adjacent country is affected by a similar reduction, depending on the estimation method.

The chapter is structured as follows. Section 4.2 reviews the existing literature on distances and border effects in the gravity model. In section 4.3 I turn to theory to derive a simple trade cost aggregation that is agnostic to the underlying gravity framework. In section 4.4 I describe the data and computation method, and discuss some features of the distances. Section 4.5 then introduces a simple framework for evaluating the results. Finally in section 4.6 I estimate the distance coefficient and evaluate the border effect and that of other common gravity co-variates using the newly computed distance measure. Section 4.7 concludes.

²See Disdier and Head (2008) and Head and Mayer (2014) for a survey.

4.2 Distances and Borders in the Literature

This chapter is of course related to a long literature on the effect of distance on trade, arguably one of the most persistent relations in economics (Head and Mayer, 2014). While it has been somewhat fashioned to declare it “dead” as the result of globalization, trade economists have come to the rescue and shown that it indeed is “alive and well” (Disdier and Head, 2008). Distance itself is however only the proxy for various trade barriers: Transportation costs, language barriers that tend to be correlated with distance, cultural, informational and even genetic distance. Some of these can be accounted for in estimations of the gravity equation with control variables, while others are more difficult to identify or yet “unexplored”. Head and Mayer (2013) develop a helpful framework to conceptualize these trade barriers and facilitators as *light* and *dark matter* of trade costs.³

Disdier and Head (2008) and Head and Mayer (2014) provide a meta analysis for the effect of distance on trade and its somewhat puzzling persistence. The effect is pronounced puzzling, because the estimated coefficient has been shown to increase over time, depending on regression technique and data used. Conventional wisdom on the other hand has it that the world is currently experiencing a “Death of Distance”.⁴ A number of approaches have aimed to reconcile the believe that in “our time of globalization” the effect of distance on the volume of traded goods should decrease rather than increase. First, as Head and Mayer (2014) show, the puzzle is prevalent mostly when using an OLS estimator. Using Santos Silva and Tenreyro (2006)’s proposed PPML estimator leads to much lower and mostly non-rising coefficients. Additionally, Head and Mayer show that the increase in the coefficient is largely due to new entrants to the trade matrix. This result is confirmed by Larch et al. (2015) who show that the presence of zeros leads the OLS estimator to be biased,

³See also section 4.5.

⁴See e.g. Friedman (2005)’s book “The World is Flat”.

unlike the estimation technique proposed by Helpman et al. (2008) that explicitly accounts for zeros. Others emphasize that we may be asking the wrong questions: Yotov (2012) e.g. argues that the distance puzzle of international trade can be explained by comparing the distance coefficient of international to intranational trade and shows that this has been indeed the case.

One difficulty in properly estimating the “true” effect of distance is that it is likely correlated with unobserved bilateral country pair characteristics. To isolate the unbiased effect of distance on trade, two recent papers exploit the variation of maritime distances in quasi-natural experiments due to exogenous events. This strategy allows them to include country-pair fixed effects that capture these correlated and unobserved characteristics. Feyrer (2009) uses the closing of the Suez canal starting in 1967 with the Six Day War and ending with the Yom Kippur War eight years later as the treatment. He estimates a coefficient between -0.15 and -0.5. These estimates however suffer from what Baldwin and Taglioni (2006) term the gold medal mistake, omitting multilateral resistance terms. Hugot and Umana Dajud (2014) perform a similar analysis, estimating the effect of the initial openings of the Suez canal in 1869 as well as that of the Panama canal in 1914 in a structural gravity model. Their estimates range between -0.38 and -0.54 for the Suez canal and -1.23 and -2.33 for the Panama canal. Both papers assume that the economic geography of the trading countries is static, but that optimal routes between countries change due to the exogenous event.

This chapter also contributes to the literature concerned with the effect of borders on trade. As will be shown below, the choice of the distance measure is consequential for estimates of the effect on a trade flow of crossing the origin country’s border to another country. The border effect first received widespread attention after McCallum (1995), who noticed an apparent puzzle: Average trade flows between Canadian provinces

were a staggering 22 times larger than the average trade flow from a Canadian province to a US state. The sheer magnitude of the effect attracted further scrutiny. A big piece to resolve the puzzle was contributed by Anderson and van Wincoop (2003). The paper provided the micro-foundations to the previous *naive* specification that related trade flows to the two countries' GDPs, various trade barriers and, importantly, physical distance. Anderson and van Wincoop showed that the omission of what they coined multilateral resistance term, the barriers to trade affecting all trading partners equally, resulted in a bias of the estimation of gravity. Accounting for these multilateral resistance terms brought down the factor of internal over external trade flows to a factor of about 5.

The literature has since further evolved and investigated the issue at different levels of aggregation of the data and on numerous geographical entities. Chen (2004) shows the existence of a strong border effect for one of the most integrated regions in the world, the European Union. Even intranational subdivisions appear to result in border effects: Ishise and Matsuo (2015) find an effect along Democratic and Republican-leaning states in the US, Felbermayr and Gröschl (2014) along the former US American South and North, while Wolf (2009) and Nitsch and Wolf (2013) find a persistent border effect along Germany's former East-West divide. Coughlin and Novy (2013) combine data on trade flows between and within individual US states from the Commodity Flow Survey with state-level export and import data and find that, surprisingly, the intranational border effect appears to be even larger than the international border effect. Poncet (2003) finds a similar pattern for China.

A number of authors have linked the puzzlingly large border effect with the choice of the distance measure. Helliwell and Verdier (2001) first noted the importance of measuring internal distance correctly for the estimation of the border effect. In an endeavour most related to this chapter, Head and Mayer (2009) suggest the harmonic mean as an "effective"

measure of distance and are the first to show the potential bias of using other measures on the estimated border effect in simulations. Hillberry and Hummels (2008), using micro-data from the Commodity Flow Survey, show that approximated distances within states and between neighboring states are often far overstated. Using accurate distances at the 5-digit zip code level reveals that the state-level border effect is in fact an artifact of geographic aggregation.⁵ Coughlin and Novy (2016) also investigate the effects of spatial aggregation on the estimation of the border effect, arguing with the help of a model that larger countries mechanically report lower border effects than smaller countries.

In the following section I turn to theory and build on earlier work from Head and Mayer (2009) to derive a theory-based trade cost aggregation.

4.3 Theory-based Trade Cost Aggregation

Following Head and Mayer (2014) the gravity equation of international trade usually comes in a form that can be reduced to

$$x_{kl} = G s_k m_l \phi_{kl}^\theta$$

where x_{kl} are exports from a location k to another location l , s_k are exporter-specific terms, m_l importer-specific terms.⁶ ϕ_{kl} is the bilateral resistance term, trade barriers and facilitators, between the two locations, θ being the trade elasticity. G can be thought of as a “gravitational constant”.⁷

⁵Interestingly, perhaps ironically, they do find a zip code-level border effect that they consider a “reductio ad absurdum”. They compute the distance between two 3-digit zip code regions as the arithmetic mean distance between all the 5-digit pairs within those 3-digit zip code regions. As will be seen below, this may be the culprit of said zip code-level border effect.

⁶See appendix D.1.1 for the following derivation with a more explicit *structural gravity* setup. The resulting aggregation is isomorphic to the one below.

⁷See Head and Mayer (2014) for a detailed survey over the different underlying micro foundations. s_k and m_l usually embody a term that has been coined multilateral

Bringing the model to the data can be considered very easy, but bears one caveat. Unfortunately most available trade data is aggregated to some degree and usually unavailable at fine-grained geographic detail.⁸ Instead it is usually aggregated to geographic entities like country, state or region. This aggregation of the left-hand side variable makes an aggregation for right-hand side variables necessary as well. In the following I derive an aggregation of trade costs that builds on Head and Mayer (2009)'s "effective", yet rarely used, distance measure.

Let k now be a location inside the geographic entity i and l inside j . Then

$$\begin{aligned} x_{ij} &= \sum_{k \in i} \sum_{l \in j} x_{kl} \\ &= G \sum_{k \in i} s_k \sum_{l \in j} m_l \phi_{kl}^\theta \end{aligned}$$

Calling $m_j = \sum_{l \in j} m_l$,

$$x_{ij} = G \sum_{k \in i} s_k m_j \sum_{l \in j} \frac{m_l}{m_j} \phi_{kl}^\theta$$

Further calling $\phi_{kj} = \left(\sum_{l \in j} \frac{m_l}{m_j} \phi_{kl}^\theta \right)^{1/\theta}$ and $s_i = \sum_{k \in i} s_k$,

$$x_{ij} = G s_i m_j \sum_{k \in i} \frac{s_k}{s_i} \phi_{kj}^\theta$$

Again, calling $\phi_{ij} = \left(\sum_{k \in i} \frac{s_k}{s_i} \phi_{kj}^\theta \right)^{1/\theta}$ finally yields the gravity equation for geographic entities

$$x_{ij} = G s_i m_j \phi_{ij}^\theta$$

resistance term, accounting for country-specific factors determining its trade with all other locations. Similarly, the parameter θ has a range of different of interpretations, as briefly outlined in section 4.5.

⁸There are some notable exceptions in recent years, using micro-level data, as briefly discussed in section 4.2.

where trade costs are aggregated as

$$\phi_{ij} = \left(\sum_{k \in i} \sum_{l \in j} \frac{s_k m_l}{s_i m_j} \phi_{kl}^\theta \right)^{1/\theta} \quad (4.1)$$

So far trade costs have been generic. Let now ϕ be described by the function

$$\phi_{kl} = \psi_{ij}^\epsilon \chi_{kl}^\delta$$

where ϕ consists of a *location-specific* component χ_{kl} , like the distance between the two locations, and an *entity-specific* component $\psi_{kl} = \psi_{ij} \forall k \in i, l \in j$, such as a common legal system or official language of the two entities. δ is then the elasticity of trade costs to the location-specific trade costs and ϵ the elasticity to entity-specific ones. Following (4.1), country-level trade costs can then be rewritten as

$$\phi_{ij} = \psi_{ij}^\epsilon \chi_{ij}^\delta$$

where location-specific trade costs are aggregated as

$$\chi_{ij} = \left(\sum_{k \in i} \sum_{l \in j} \frac{s_k m_l}{s_i m_j} \chi_{kl}^{\theta\delta} \right)^{1/\theta\delta} \quad (4.2)$$

so that finally

$$x_{ij} = G s_i m_j \psi_{ij}^{\theta\epsilon} \chi_{ij}^{\theta\delta} \quad (4.3)$$

The exports of a geographic entity i to an entity j are therefore governed by the exporter- and importer specific terms s_i and m_j , entity-specific trade costs $\psi_{ij}^{\theta\epsilon}$, and the weighted *generalized mean* of location-specific trade costs $\chi_{ij}^{\theta\delta}$. As Head and Mayer (2009) point out, the generalized mean has the convenient properties of reducing to the arithmetic mean for $\theta\delta = 1$ and the harmonic mean for $\theta\delta = -1$. It can be shown that it also nests the geometric mean for $\theta\delta = 0$. Importantly though, equation (4.2) asserts

that the elasticity of trade with respect to location-specific trade costs $\theta\delta$ is also the exponent in this generalized mean.

In the discussion below I focus on distance as a generally acknowledged proxy for location-specific trade costs. Other common trade cost components include the existence of a RTA, a common currency, as well as shared language, common legal system, or colonial legacy. It is safe to assume that under most circumstances these can be classified as entity-specific trade costs. For most gravity aficionados the weighted arithmetic mean of great circle distances between the two countries' largest cities, readily provided by Mayer and Zignago (2011) as *distw*, has been the go-to choice of a distance measure. Using these distances implicitly sets $\theta\delta = 1$. Mayer and Zignago also provide the harmonic mean of city distances, *distwces*.

Equations (4.2) and (4.3) however yield specific instructions on how to compute distances between trading entities consistently with theory. The weights in the general mean should incorporate information for *all* exporting and importing locations. Most importantly, the coefficient $\theta\delta$ should equal the (estimated) distance coefficient in the gravity equation. The remainder of the chapter is concerned with calculating distances following these instructions and its implications for estimations of the gravity equation. In the following section I describe the data and process used to compute the distances.

4.4 Accurate Distances using Satellite Imagery

The great circle distance between two locations—“as the crow flies”—is generally assumed to be a good proxy for transport costs, but also for cultural and informational separation. When taking distances primarily as a proxy for transportation costs, other possible and plausible types of distances, or rather routes, come to mind. For landlocked countries or

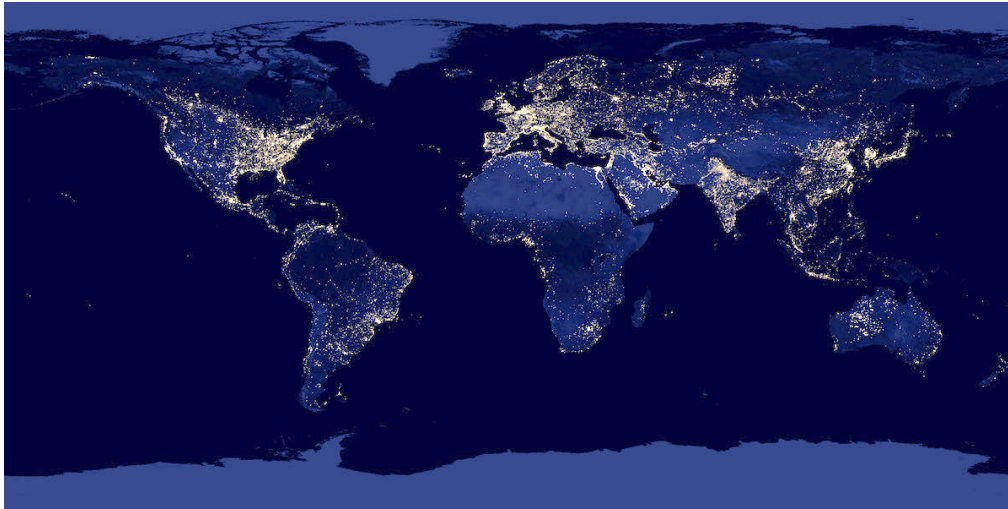


Figure 4.1: Nighttime light emissions in 2012 (Source: NOAA)

those on large and integrated landmasses, road distances are likely appropriate. Roads tend to circumvent inconvenient geographical features such as mountains, deserts and lakes that represent a more costly direct passage. While some recent papers, including Faber (2014) and Storeygard (2016), make directly or indirectly use of the information on road systems within countries—or even within Europe in the case of Felbermayr et al. (2016)—wider cross country coverage in fine detail is only slowly becoming more available. Islands or coastal countries, on the other hand, likely rely more on seaborne trade than road shipping, making distances along global sea lanes more appropriate, as provided by Bertoli et al. (2016). Owing to the limited computational complexity and a wider array of trade costs to proxy, I will follow Mayer and Zignago (2011) and others in using the great circle distance to compute distances between two locations.

Aside from the type of route between locations, the locations to be used in the aggregate distance themselves are a matter of discussion. Citing concerns with previous ad-hoc measures such as the distance between capitals or largest cities for international distances and area-based measures for internal distances, Head and Mayer (2009) propose to use population

data as the weights for their distance aggregation, so that (4.2) becomes

$$d_{ij} = \left(\sum_{k \in i} (\text{pop}_k / \text{pop}_i) \sum_{l \in j} (\text{pop}_l / \text{pop}_j) d_{kl}^{\theta\delta} \right)^{1/\theta\delta} \quad (4.4)$$

where d_{kl} is the great-circle distance between the geographic centers of two cities k and l , and $\text{pop}_k / \text{pop}_i$ the share of city k 's population in the total population of all cities in country i . Their population data comes originally from UN statistics. Aside from usual data collection issues that may lead to inaccuracies, there are three important caveats. First, the data is limited to a maximum of 25 cities, while economic activity is likely not limited to only those. This is a particular limitation for geographically large and populous countries like the US or China. Second, there exists only one data point for several geographically small countries, like Luxembourg and Singapore. Here the authors resort to previously discredited area-based measures. Third, the data is only available for the year 2004. This assumes a static economic geography. This may be particularly questionable in developing and emerging economies.

4.4.1 Nighttime Light Emissions Data

In trying to improve upon the existing measure, I am opting to use a different source of information on the sprawl of economic activity: Nighttime satellite imagery. Figure 4.1 shows the fascinating picture of light visible from space, displaying the extent of human activity – and their exact geographic location. The National Oceanic and Atmospheric Administration (NOAA) provides the imagery since 1992 on a yearly basis. Each image is a composite of average light emission over the course of the year. The image is recorded on cloud-free evenings between 8:30pm and 10pm local time by the United States Air Force Defense Meteorological Satellite Program. The satellite's sensor's received radiance is coded as a so-called digital number (DN) on a scale from 0 to 63. The resolution is 30 arc-seconds, which translates into about 860m at the equator. Each yearly image then

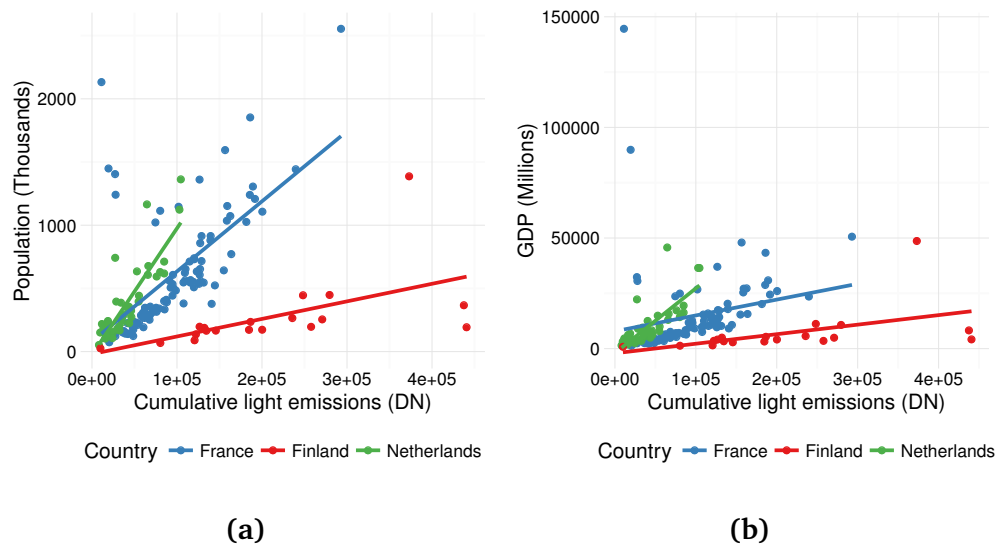


Figure 4.2: Light emissions and GDP or population by NUTS3 region.

has a total of 725,820,001 pixels. Of these, roughly 60 million are on land and illuminated at some point in the time span between 1992 and 2012.

Using this data has a number of advantages. First, not only urban centers but also rural areas are present in the data. Second, even the smallest countries cover at least hundreds of pixels. Luxembourg has around 4800 illuminated pixels and even the city-state Singapore has around 900. Third, the annual periodicity of the data allows me to calculate distances for each year, reflecting changes in the economic geography of countries. As an additional bonus, data collection issues, that are likely to affect city population figures, are sidestepped. All of these features significantly improve upon existing data, as shown below in section 4.5.

Nighttime satellite imagery in general has been discovered as intriguing data for economic research before. Most prominent is Henderson et al. (2011)'s paper on the estimation of growth rates, comparing year-on-year changes of light intensities. Others, like Alesina et al. (2012) and Hodler and Raschky (2014) investigate economic inequality and favoritism, by delineating changes in light intensity along ethnic and regional lines. To

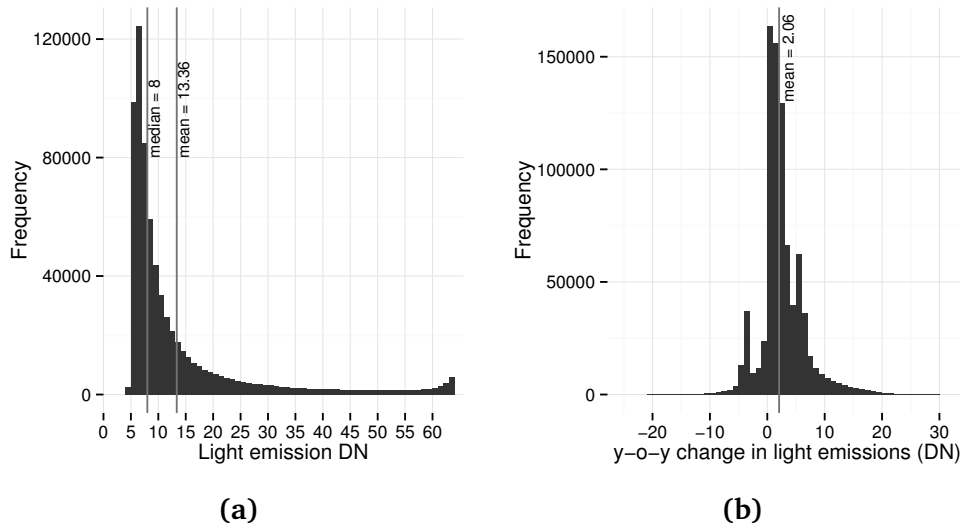


Figure 4.3: Distribution of (a) light emissions in France in 2000 and (b) its year on year changes.

my knowledge, I am the first to explicitly make use of the geographic information embedded in the data for economic research.

The use of light emissions data however also presents some challenges. To handle the size of the matrix of distances between all illuminated locations on Earth while maintaining general validity, I compute a reduced matrix composed of data from a sample of illuminated cells. The sample is constructed by drawing randomly 100 times 1 % and a minimum of 1000 from each country's illuminated cells. This reduces the total number of elements in the distance matrix to about $3.6 \cdot 10^{12}$. Next to managing these computational limitations and other technical issues such as the comparability of radiance figures over time,⁹ a number of issues warrant attention. First, do light emission proxy well for the share of importer and exporter-specific terms, as required by equation (4.1)? In order to validate this, I aggregate light emission of European countries to NUTS3 region level. This allows me to compare total light emissions of each region with statistics that are usually assumed to have a close connection to importer- and exporter specific terms: Economic output as measure by GDP and

⁹See appendix D.2 for a description of the data processing.

total population. Figures 4.2a and 4.2b show that total light emissions and these measures appear to be highly correlated *within* each country.¹⁰

Second, light emissions may be erratic over time and not reflect true changes in the economic geography of a country. Figure 4.3a shows the distribution of light emissions in France, a country where little variation over time can be expected, in 2000 and figure 4.3b its year-on-year changes. The bulk of light emissions are of low intensity and the year-on-year variation is very limited, signaling no drastic movements.

4.4.2 Computing Theory-consistent Distances

After some initial pre-processing of the data, I can proceed to computing the aggregate distance between each country pair for all years between 1992 and 2012. As Head and Mayer (2009), I assume that importer and exporter-specific terms in a location have the same share in their entity-aggregated importer and exporter-specific terms. Calling this share $w_k = \frac{s_k}{s_i} = \frac{m_k}{m_i}$, equation (4.2) can be rewritten in matrix form as

$$d_{ij} = \left(\mathbf{w}_i^T \mathbf{D}_{ij}^{\theta\delta} \mathbf{w}_j \right)^{1/\theta\delta} \quad (4.5)$$

where

$$\mathbf{w}_i = \frac{1}{\sum_{k \in i} w_k} \begin{pmatrix} w_1 \\ \vdots \\ w_k \end{pmatrix} \quad (4.6)$$

¹⁰Table D.1 shows the corresponding coefficients of regressing population and GDP figures on corresponding aggregate light emissions by NUTS3 region. The R^2 is 0.74 and 0.47 respectively.

and w_j accordingly, and

$$\mathbf{D}_{ij} = \begin{pmatrix} d_{1,1} & \cdots & d_{1,l} \\ \vdots & \ddots & \vdots \\ d_{k,1} & \cdots & d_{k,l} \end{pmatrix} \quad k \in i, l \in j \quad (4.7)$$

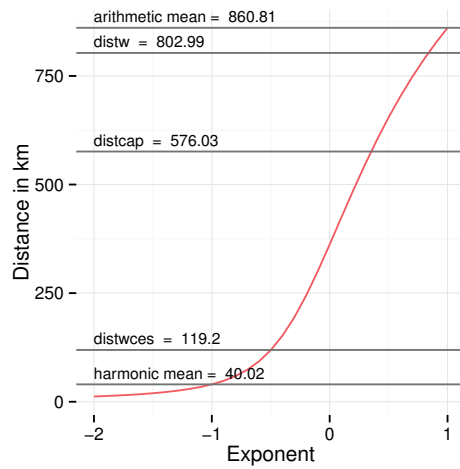
where $d_{k,l}$ is the great circle distance between locations k and l . The great circle distance between any two points is approximated by the spherical law of cosines.

Using the described nighttime light emissions data, w_i is then proxied by the vector of each location k 's share in the total light emissions of country i .

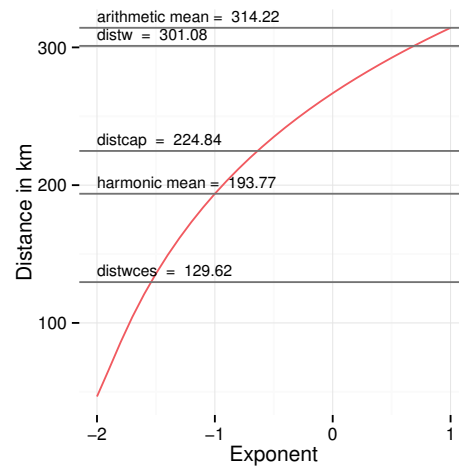
4.4.3 Distance Variation over Time and by Exponent

As derived above, the exponent in the generalized mean is supposed to be equal to the elasticity of trade with respect to distance. In the literature the exponent $\theta\delta$ is usually implicitly set at 1 by the use of arithmetic mean distances, although traditionally estimation place the distance elasticity somewhere in the broader neighborhood of -1 , calling for the use of harmonic mean distances.

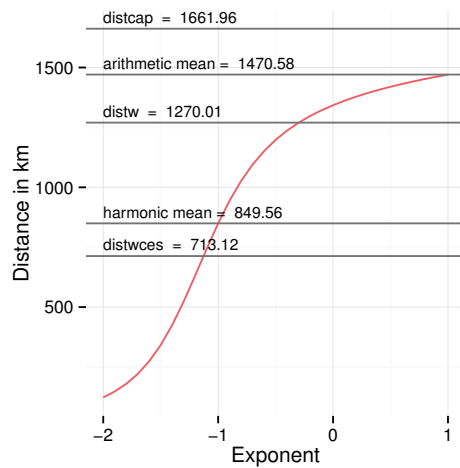
Figure 4.4 displays the computed bilateral distances as a function of the exponent $\theta\delta$ for four exemplary country pairs, including the distances provided by Mayer and Zignago (2011) for comparison. The results highlight the importance of picking the correct exponent. The difference between commonly used arithmetic distances and harmonic distances is particularly large for developing countries and internal distances. Figure 4.4a shows a difference for the internal distance of Democratic Republic of Congo between harmonic and arithmetic mean of factor 21. Yet even for a developed economy such as Germany the factor remains at 1.6. Figure



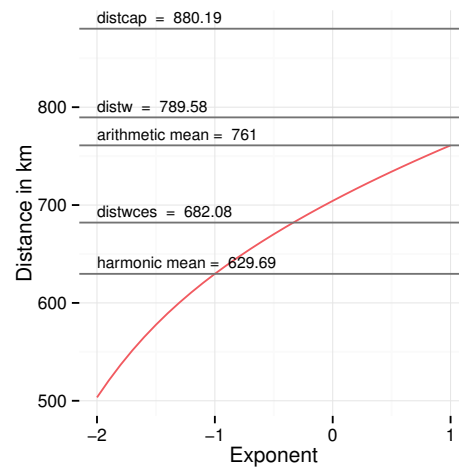
(a) Distance COD - COD



(b) Distance DEU - DEU



(c) Distance COD - RWA

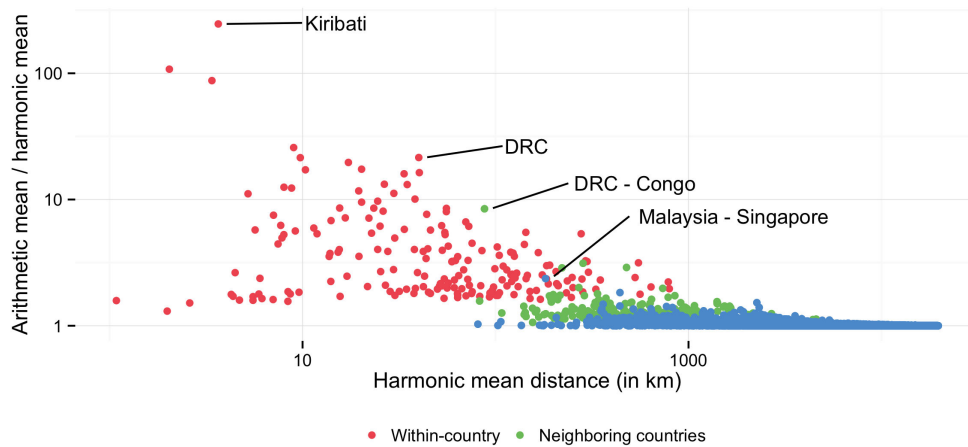


(d) Distance DEU - FRA

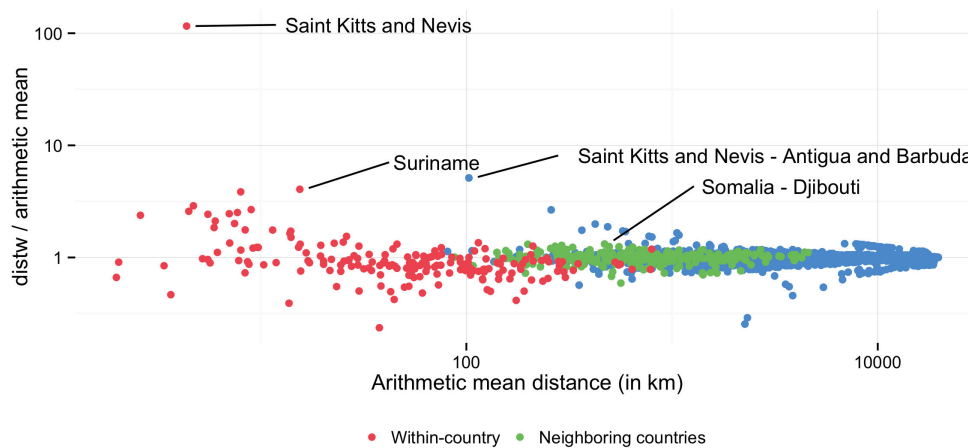
Figure 4.4: Aggregate distances depending on the exponent in generalized mean in 2000. Commonly used distances from Mayer and Zignago (2011) for comparison.

4.4c shows the schedule for the country pair of the Democratic Republic of Congo and Rwanda. The ratio between arithmetic and harmonic mean stands at 1.7. For the distance between Germany and France the ratio is lower but still at 1.2.

With respect to estimations of the gravity equation this entails an important effect that will be shown empirically in section 4.6: Assuming that the true aggregate distance is a harmonic mean, using arithmetic mean



(a)



(b)

Figure 4.5: Bias of arithmetic over harmonic distances (a) and measurement error of Mayer and Zignago (2011)'s *distw* over arithmetic distances (b).

distances biases the estimation, as short distances are overstated. Figure 4.5a plots the ratio of arithmetic over harmonic mean distances against harmonic mean distances.¹¹ Again it becomes clear that internal distances are more affected than external distances and shorter distances are more affected than larger ones. In a gravity estimation this effect will be mainly picked up by the border coefficient. As internal distances are overesti-

¹¹It can be shown that in a hypothetical setting in which distance were the only trade cost, this ratio of arithmetic to harmonic mean is equal to the bias of the border effect, i.e. the exponent of the border coefficient, in an OLS estimation.

mated relative to external distances, the border effect is artificially inflated as there is “too little” trade externally.¹² The effect could also partially be picked up by any variable that is correlated with shorter distances, as the effect itself decreases with distance.¹³

Figure 4.5b highlights the issue of mismeasurement when using human-collected data and displays the aforementioned advantage of using satellite imagery for the weighting of the mean. Arithmetic mean distances calculated with satellite images, i.e. $\theta\delta = 1$, vary significantly from Mayer and Zignago (2011)’s *distw*, calculated with city-level population data. For geographically smaller countries and developing and emerging economies a much higher detail of information is available than through figures manually collected.

Another benefit of using light emissions data from satellite imagery as weights for the distance calculation is, as discussed above, its yearly availability. This allows me to calculate distances between all country pairs for each year since 1992.¹⁴ Figure 4.6 shows the variation over time of the previously discussed arithmetic and harmonic mean distances for the same country pairs as in figure 4.4. The variation is again noticeably larger for developing countries. The internal distance of the Democratic Republic of Congo varies over the range of 35 to 63 kilometers when measured as a

¹²Due to the saturation of the sensor of the satellite the radiance data is top-coded at DN 63, i.e. all values larger than 63 are coded as 63. This obviously biases the measurement: The computed harmonic mean might be still *overstating* the distance, so that the difference to the arithmetic mean could be even larger.

¹³One concern with a negative parameter $\theta\delta$ in the generalized mean is that very small distances receive a lot of weight in the aggregate, therefore making the measure dependent on the smallest distances in the data. Figures D.1, D.2 and D.3 in appendix D.3 show that in the present case this should not be of much concern. While the response of the harmonic mean to omitting smaller values is mechanically stronger than for the arithmetic mean, the distribution of distances, owing to the large number of locations, prohibits any drastic responses.

¹⁴That is, given they existed at that point in time. There are a number of new countries in the data in the wake of the disintegration of former Yugoslavia, as well as territorial changes in other parts of the world. I use data on border locations from Weidmann et al. (2010). This provides an additional source of time variation that is not due to changes in economic geography.

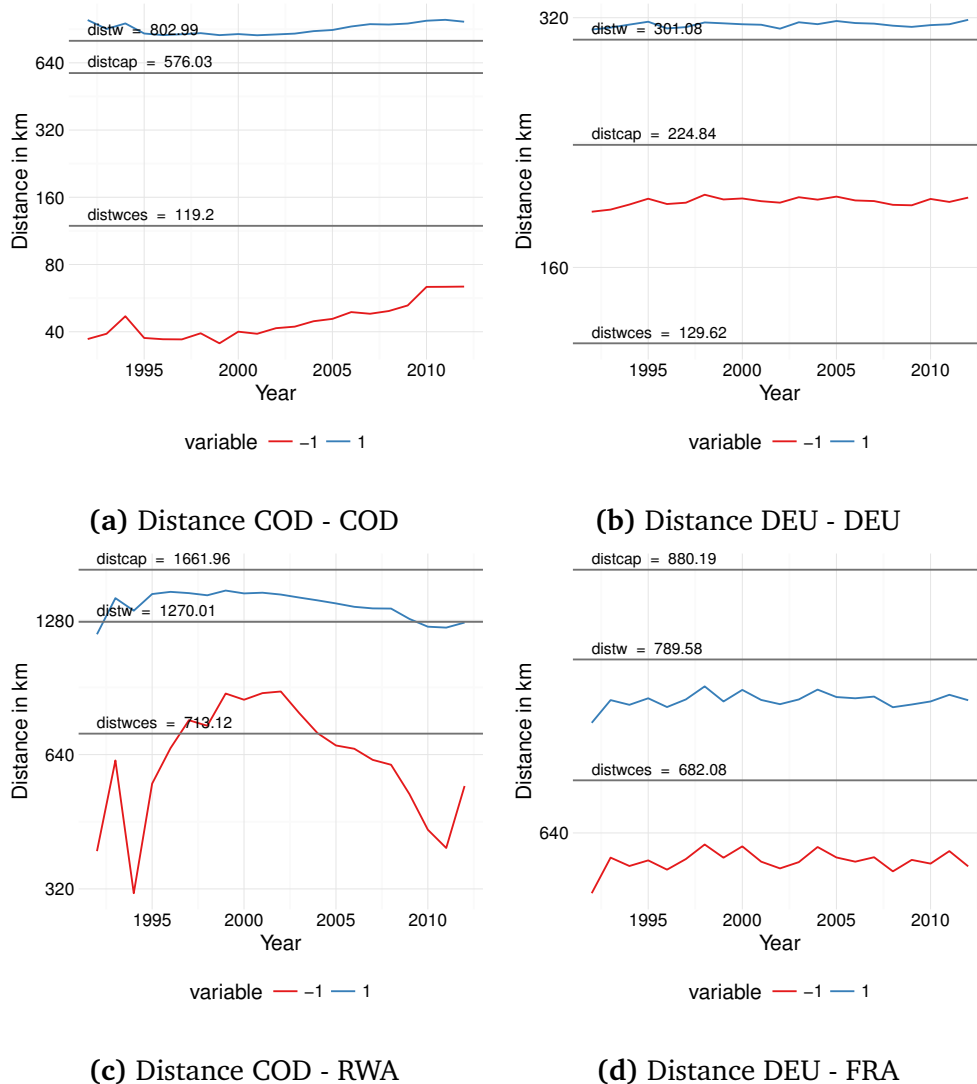


Figure 4.6: Aggregate distances over time (Exponents in generalized mean of -1 and 1). Commonly used time-invariant distances from Mayer and Zignago (2011) for comparison.

harmonic mean and 850 to 997 kilometers for the arithmetic mean. For a high income country like Germany, this variation is expectedly much lower and lies between 187 and 195 kilometers for the harmonic mean and 309 and 318 for the arithmetic mean. Variation is also observed for between-country distances, although the effect itself is again a decreasing function of distance. The country pair of the Democratic Republic of Congo and Rwanda varies between 313 and 886 kilometers (1191 to 1492 for the arithmetic mean) with a staggering drop of almost 50 % from 1993

to 1994—the year of the Rwandan genocide. The country pair Germany - France exhibits much less variation and ranges between 594 and 631 kilometers for the harmonic mean (731 to 764 for the arithmetic mean). Overall the variation over time is not negligible, especially for internal distances and country pair distances for geographically close countries.

As noted in section 4.2, other research endeavours have previously estimated the effect of distance on trade in the within dimension of a panel. Feyrer (2009) and Hugot and Umana Dajud (2014) exploit an exogenous shock to maritime shipping distances in order to assess the effect. While, as will be seen below, their estimates are comparable, their approach exhibits one noticeable difference. In their case, the locations of economic activity are assumed to be static, but the optimal route connecting the importing and exporting entity changes. In the present case, I assume the converse: The geography of economic activity is assumed to be changing over time, while optimal routes between locations are static. One could also envisage a combination of the two approaches, using data on developing road networks as well as changes to maritime shipping lanes, combined with data on the changing economic geography of countries. As data on transportation systems with global coverage is still largely unavailable and in the interest of lower computational complexity, I take the routes between locations to be constant.

Assuming routes to be constant and the economic geography to be time-varying however means that there is the possibility that the change in distances over time is actually driven or influenced by an endogenous process: Economic activity could move closer to the border with another country in anticipation of more trade with said country. The result would be observed as a shorter aggregate distance and more trade. An example could be the car industry in southern Ontario, Canada: Due to the automobile production on the American side of the border, Canadian manufacturing companies might move closer to the border to reduce trans-

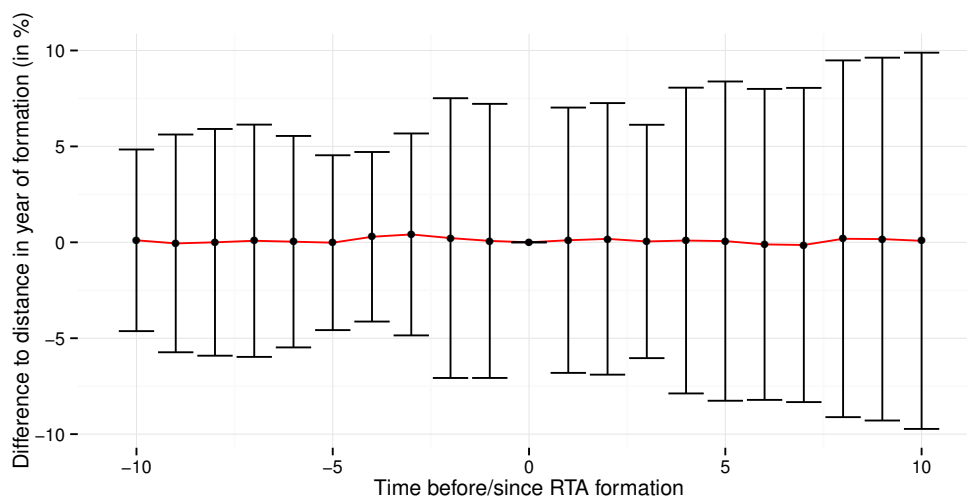


Figure 4.7: Mean change of distance for neighboring countries in RTAs in 10 years prior and after the formation. Bars display the 95% confidence interval.

portation costs. One would then observe higher cross-border activity as well as shorter distances due to the relocation of economic activity. While this mechanism cannot be entirely ruled out, figure 4.7 suggests that a reduction in trade barriers (the formation of an RTA), or anticipation thereof, has no significant influence on the distance between neighboring countries. The mean percentage difference of the distance in the ten years around the formation of a RTA to the year of its formation is never significantly different from 0.¹⁵

Figure 4.8 displays a further test for the validity of the use of nightlight data for the weights. I recompute the aggregate internal distance for the United Kingdom, however now using for the weights *calibrated* nightlight data (blue line) made available by Hsu et al. (2015) and gridded population data from the 2011 UK census (green line) made available by Reis (2016). The red line denotes the distance computed using the “regular” nightlight data used for the computations above. The difference between the regular nightlight data and calibrated nightlight data is the absence of

¹⁵See also figure D.4 in the appendix that shows the change of distances between Mexico and the bordering US States of Texas, New Mexico, Arizona and California relative to 1994, the year NAFTA came into force. No clear pattern is visible with respect to smaller distances in the aftermath of the trade agreement.

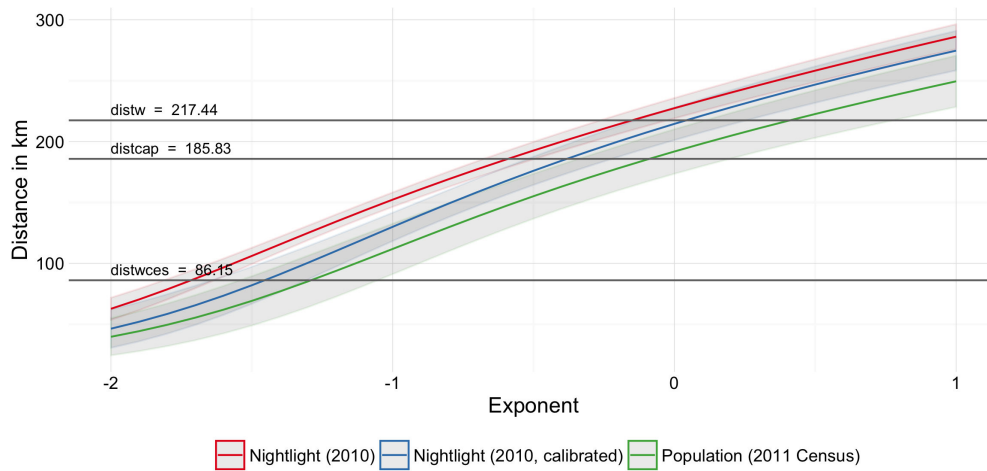


Figure 4.8: Distance for the UK with different data sources for weights (95 % confidence interval)

top-coding of radiance, likely giving more weight to well-light urban areas. This in turn could yield consistently lower distances as a smaller share of emitted light comes from non-urban areas. The population-weighted distance in turn could give even more weight to densely populated areas—e.g. through multi-story buildings—resulting in even smaller (although not always significantly) distances. Due to technical limitations of the sensor on the satellites this data is only available for select years (Hsu et al., 2015). For reference, the customary measures from Mayer and Zignago (2011) are again displayed as horizontal bars. The computed distances all display the same pattern and are significantly lower than *distw* for the standard distance elasticity as exponent at -1. In fact, it appears as if distances computed using the uncalibrated nightlight data could still slightly overstate actual distance, although for almost all exponents the three distance measures are not statistically different at the 5 % significance level.

4.5 Evaluating the new Distance Measure

Before running gravity equations with the computed distances in section 4.6, it is useful to construct a framework against which to evaluate the results. In their research program on gravity equations, Head and Mayer (2013) borrow another analogy from physics to describe the *known unknowns*¹⁶ of trade barriers: *Dark* trade costs. In physics, dark matter describes the seemingly immeasurable mass that leads to measurable outcomes that can otherwise not be reconciled with orthodox theories. In the present context of international trade, dark trade costs describe the fraction of trade costs that is observed but not quantifiable in usual terms of tariffs, transportation costs or other trade barriers and facilitators such as a common language spoken in two trading countries.

In section 4.3 trade costs ϕ_{ij} were assumed to have the form of

$$\phi_{ij} = \psi_{ij}^{\epsilon} \chi_{ij}^{\delta}$$

where ψ_{ij} is an *entity-specific* trade cost and χ_{ij} the aggregate of *location-specific* ones. ψ_{ij} can equivalently be thought of as capturing any type of border effects, while χ_{ij} captures distance effects. ϵ and δ are then the elasticities of trade costs to border and distance, respectively. When estimating a gravity equation, one usually estimates the elasticities of *trade* to these specific trade costs, that is to say $\theta\delta$ and $\theta\epsilon$.¹⁷ The elasticity of trade to trade costs, θ , is a standard parameter in most theoretical models that yield a gravity-type expression. As Head and Mayer (2014) explain in further detail, it is $\sigma - 1$, i.e. the elasticity of substitution less 1, in Anderson and van Wincoop (2003)-type models; in Ricardian models à la Eaton and Kortum (2002) the parameter governs the distribution of labor

¹⁶Hat tip to former US Secretary of Defense Donald Rumsfeld, who popularized this term. However, it seems to originally have been coined by Nassim Nicholas Talib and/or NASA administrator William Graham.

¹⁷See Head and Mayer (2014) for a survey of studies that aim to estimate ϵ and δ directly.

requirements across countries; and in Chaney (2008), θ determines firm heterogeneity. In most cases, Head and Mayer (2014) report in a meta analysis, θ is in the range between 3 and 9, with a median of 5.

Following the analogy from physics, the observed distance coefficient can be broken down into

$$\theta\delta_g = \theta(\delta_l + \delta_d) \quad (4.8)$$

and analogously the border coefficient into

$$\theta\epsilon_g = \theta(\epsilon_l + \epsilon_d) \quad (4.9)$$

where the subscript g denotes the *gross* coefficient, l denotes *light* trade costs, i.e. known impediments or facilitators to trade, and the subscript d the above-mentioned *dark*, or unknown trade costs. In the exercise below, I exploit the time-variation that is present in the computed distances in order to estimate both $\theta\delta_g$, the gross effect of distance on trade, and $\theta\delta_l$, the measurable and unbiased direct effect of distance on trade. The difference between the two, $\theta\delta_d$, is the dark part.

4.6 Iterative Estimation of the Gravity Equation

When estimating a gravity equation in the cross section, the estimated coefficient for distance also captures other entity-specific effects that are correlated with distance, such as cultural similarity. Traditionally the elasticity of trade to distance has been estimated to be in the neighborhood of -1 , relating nicely to the original analogy from physics. In a meta survey Disdier and Head (2008) find the mean of estimates to be -0.9 (with 90% of estimates between -0.28 and -1.55). Head and Mayer (2014) update

this survey and report for structural estimations a mean of -1.1 (standard deviation of 0.41) and for all estimations including naive gravity, a mean of -0.93 (standard deviation of 0.4).

As noted above, the time-variation of the data allows me to exploit the within-dimension of the data to estimate the distance coefficient. The choice of the exponent in the generalized mean, as laid out in the previous section, makes a significant difference in the computed aggregate distance. In the following I use results from section 4.3 to aggregate distances using an iterative approach to find the *unbiased* exponent $\theta\delta_l$.

Recall that

$$\chi_{ij} = \left(\sum_{k \in i} \sum_{l \in j} \frac{s_k m_l}{s_i m_j} \chi_{kl}^{\theta\delta} \right)^{1/\theta\delta}$$

where the exponent $\theta\delta$ is a parameter in the gravity equation

$$x_{ij} = G s_i m_j \psi_{ij}^{\theta\epsilon} \chi_{ij}^{\theta\delta}$$

The equation can easily be estimated with an OLS estimator in its log-linearized form as

$$\begin{aligned} \log X_{ij} = & \alpha_0 + S_i + M_j + \alpha_1 \cdot \mathbf{Controls}_{ij} + \\ & \beta_0 \cdot \mathbf{Border}_{ij} + \beta_1 \cdot \log \mathbf{Distance}_{ij} + \epsilon_{ij} \end{aligned} \quad (4.10)$$

or using the PPML estimator proposed by Santos Silva and Tenreyro (2006) as

$$\begin{aligned} X_{ij} = & \exp(\alpha_0 + S_i + M_j + \alpha_1 \cdot \mathbf{Controls}_{ij} + \\ & \beta_0 \cdot \mathbf{Border}_{ij} + \beta_1 \cdot \mathbf{Distance}_{ij}) + \epsilon_{ij} \end{aligned} \quad (4.11)$$

The variables of interest are the estimated coefficients $\beta_1 = \theta\delta$ for the distance measure and later $\beta_0 = \theta\epsilon$ for the border effect. S_i is an exporter fixed effect and M_j an importer fixed effect that capture everything that is country-specific. Controls_{ij} is a vector of usual bilateral gravity control variables such as contiguity, common language, historical colonial ties, a common currency and the existence of an economic integration agreement.

I estimate equations (4.10) and (4.11) in multiple specifications: First in section 4.6.1 in a panel, exploiting the within-dimension in order to obtain the unbiased effect of distance on trade. The addition of a country-pair fixed effect FE_{ij} in the panel estimation captures all bilateral time-invariant characteristics. While this eliminates unobserved time-invariant country-pair features, it also captures the border coefficient β_0 . In a second step in section 4.6.2 I estimate equations (4.10) and (4.11) in the cross section annually. This allows me to estimate the border effect using those distances computed with the distance coefficient from the panel estimation.

The iterative estimation procedure is as follows: Using an arbitrary initial value,¹⁸ I estimate the gravity equation, retrieve the distance coefficient β_1 and then use it as the $\theta\delta$ in the calculation of the aggregate distance in equation (4.5). This new distance is then used for the next iteration. I repeat this process until the coefficient β_1 remains unchanged in its 5th digit.

In order to ensure robustness of the results I use multiple trade data sources and estimate on several different samples. For the panel estimation trade data comes primarily from the IMF DOTS dataset (International Monetary Fund, 2015), as it provides wide and continuous coverage

¹⁸I choose the value 0, i.e. the assumed absence of an effect of distance on trade. The choice has no influence on the end result, it only influences the number of iterations to get there. Rearranging and taking logs of $x_{ij} = Gs_i m_j \psi_{ij}^{\theta\epsilon} \chi_{ij}^{\theta\delta}$ yields $\theta\delta = \frac{\log x_{ij} / Gs_i m_j}{\log \chi_{ij}(\theta\delta)}$. As $\log \chi_{ij}(\theta\delta)$ is an increasing function of $\theta\delta$, any ex ante setting higher or lower than the true $\theta\delta$ will yield a new estimated $\hat{\beta}_1$ closer to the true one than before and therefore the sequence converges.

	Dependent variable: $\log(\text{flow})$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(\text{Distance})$	-1.282*** (0.007)	-1.264*** (0.006)	-1.260*** (0.006)	-0.407*** (0.125)	-0.950*** (0.100)	-0.927*** (0.100)
Distance	arithmetic	harmonic	iterate	arithmetic	harmonic	iterate
Pair FE	No	No	No	Yes	Yes	Yes
No. of Iterations	-	-	4	-	-	12
Observations	177,996	177,996	177,996	177,996	177,996	177,996
R ²	0.785	0.787	0.787	0.925	0.925	0.925
Adjusted R ²	0.776	0.778	0.778	0.918	0.918	0.918

Notes: All regression include exporter \times year and importer \times year fixed effects. Robust standard errors in parentheses are clustered by importer \times exporter. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 4.1: OLS estimation - pooled and within-dimension

over the whole time period from 1992 to 2012. For robustness checks I use UN COMTRADE data (United Nations Statistics Division, 2015). For estimations where external and internal flows are separated, in particular in the cross section estimations in section 4.6.2, I use the TradeProd dataset (De Sousa et al., 2012). It has the advantage of having consistent figures for internal and external trade. For the other two data sources, I calculate internal trade as the difference between GDP and total exports, per usual following Wei (1996). Data on RTAs and currency unions come from De Sousa (2012), other time-invariant variables come from CEPII (Mayer and Zignago, 2011).

4.6.1 Distance Effect

As a benchmark I estimate equation (4.10) in a balanced pooled panel. Then I re-estimate controlling for unobserved country-pair characteristics with country-pair fixed effects FE_{ij} . I further control for time-varying bilateral variables, RTA and common currency.¹⁹ Columns (1) to (3) of table 4.1 report the results for the benchmark pooled panel with different distance measures, arithmetic and harmonic mean distances as well as those from the generalized mean through iteration. The coefficients on dis-

¹⁹Coefficients are suppressed here but are almost identical to usual within-estimations of RTA and common currency coefficients.

	Dependent variable: $\log(\text{flow})$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(\text{Distance})$	-1.019*** (0.098)	-1.177*** (0.208)	-0.615* (0.322)	-0.860*** (0.282)	-1.399*** (0.288)	-0.771** (0.323)
Distance	iterate	iterate	iterate	iterate	iterate	iterate
Pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Dataset	DOTS	DOTS	DOTS	DOTS	COMTRADE	TradeProd
Sample	Neighbors	External	High inc.	Low inc.	all	all
No. of Iterations	14	6	21	13	6	27
Observations	30,429	175,140	31,395	2,646	87,969	132,795
R ²	0.971	0.919	0.959	0.967	0.929	0.927
Adjusted R ²	0.961	0.911	0.954	0.934	0.921	0.918

Notes: All regression include exporter \times year and importer \times year fixed effects. Robust standard errors in parentheses are clustered by importer \times exporter. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 4.2: Robustness checks - different samples and datasets

tances do not vary much between the measures. This changes drastically when introducing the country-pair fixed effects, wiping out all distance-correlated but time-invariant characteristics. Columns (4) to (6) report those coefficients for the same distances measures. The distance coefficient drops markedly to -0.41 for the arithmetic mean, while the coefficients with harmonic mean and iterated general mean with -0.95 and -0.93 are in the close vicinity of -1 , in line with customary cross-section estimations in the related literature. All coefficients are highly significant. The results strongly suggest that the unbiased distance coefficient is close to -1 . The important take-away for estimations of the gravity equation is that, as laid out in section 4.3, this result calls for using aggregate distances that use the generalized mean with a coefficient of -1 , i.e. the harmonic mean. Arithmetic mean distances strongly overstate short distances, as shown in section 4.4.3.

In order to ensure the robustness of the results I estimate the same equation on different samples and datasets. Table 4.2 column (1) reports the coefficient on neighboring country pairs, countries that directly share a border or are within a 2000km distance. Section 4.4.3 suggests that here the highest variation would be found. Again the distance coefficient is very close to -1 . Column (2) reports the coefficient of -1.18 when re-

stricting the sample to external trade. This suggests that the average effect of distance on *internal* trade is lower relative to that than on external trade, which appears reasonable and is in line with results from Yotov (2012). Columns (3) and (4) report the coefficient for what the World Bank classifies as high income and low income countries. The coefficient for high income countries is about 30% lower than for low income countries, which again appears reasonable. Finally columns (5) and (6) report the coefficient when using UN COMTRADE and TradeProd data. Both datasets have much lower numbers of observations than IMF DOTS, which might explain the difference in the estimated coefficients. However both coefficients, -1.4 for COMTRADE and -0.77 for TradeProd, are well in the range of reasonable results.

The results are appealing. The coefficient estimated in the preferred specification is highly significant and closely resembles the traditional estimate of the distance coefficient of around -1 . Estimates from the other specifications are all well in the range of traditional estimates surveyed by Disdier and Head (2008) and Head and Mayer (2014). Judging the results in terms of the framework setup in section 4.5, the estimated coefficient from the pooled panel regression can be thought of as the gross distance effect $\theta\delta_g$ from equation (4.8), while $\theta\delta_l$ is the coefficient estimated in the within dimension. Differentiating then between the light and dark shares of the distance effect in terms of equation, I find that

$$\begin{aligned}\theta\delta_g &= \theta(\delta_l + \delta_d) \\ -1.26 &= -0.927 + \theta\delta_d\end{aligned}$$

so that dark trade costs make up a share of $\delta_d/\delta_g = 0.264$. About one quarter of the traditionally measured distance effect is *dark*, i.e. due to trade costs that are merely correlated with distance.

The estimated coefficients for distance elasticity being very close to the customary estimate of -1 , the results call for generally using harmonic

mean distances in estimations of the gravity equation, as opposed to the traditionally used arithmetic mean distances. In the following, I analyze the effect using the former as opposed to the latter on various standard gravity control variables.

4.6.2 Border Effect

As the border effect is captured by the country-pair fixed effect in the within-dimension of the panel estimation, I resort to estimating it in the cross section annually. To ensure comparability, I use the same balanced panel as before and stratify by year, while bearing in mind that the bilateral coefficients might pick up other effects, as they cannot be controlled for with a country-pair dummy.

There is some disagreement as to how to estimate and interpret the border effect. This often makes a comparison of the estimated coefficients difficult, if not impossible. Some authors are arguing over whether other gravity controls, such as a dummy for RTA, neighboring country, or historical colonial linkages, should be set to either 0 or 1 for internal flows. The choice indeed makes a large difference on the estimates border coefficient. Suppose a setting as in De Sousa et al. (2012) in which the border dummy takes 1 for internal flows. All other variables take 1 only if they apply for the external flow, e.g. for the US and UK the dummies for common language and former colonial relation are set to 1. For internal flows, the dummy is set to 0. With this setting, the border coefficient, i.e. the coefficient for *internal* flows, increases *ceteris paribus* with any added dummy variable for a trade facilitator and decreases with any additional trade barrier that is controlled for. The benchmark, against which to evaluate the border effect thus depends on the nature and number of added control variables. What is then measured is therefore *not* the average effect of a border on trade, but the effect of crossing the border to a country for which none of the bilateral dummies is set 1. More importantly though,

	Dependent variable:			
	log(flow)		flow	
	(1)	(2)	(3)	(4)
log(distance)	-1.530*** (0.033)	-1.464*** (0.031)	-0.886*** (0.025)	-0.813*** (0.018)
border	1.959*** (0.202)	0.956*** (0.212)	2.091*** (0.053)	1.728*** (0.050)
Estimator	OLS	OLS	PPML	PPML
Distance	arithmetic	harmonic	arithmetic	harmonic
Observations	4,220	4,220	4,220	4,220
R ²	0.856	0.856		
Adjusted R ²	0.848	0.849		

Notes: All regression include exporter and importer fixed effects. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 4.3: Border coefficient estimation with TradeProd data

and present whenever including *any other* co-variates next to a border dummy and distance measure, the setting entails interpreting internal flows to be subject to directly comparable trade barriers and facilitators as external trade flows. This may be plausible for common language, but fails at the colony dummy.²⁰

I therefore estimate the border coefficient, the gross effect of crossing a border, by exclusively including the border dummy next to distance, at the expense of having the distance coefficient capture (part) of those trade costs that are correlated with distance. Thinking in terms of dark and light parts of trade costs from equation (4.9), the estimated coefficient is then θ_{ϵ_g} . Table 4.3 reports the coefficients for the estimations using TradeProd data for the year 2000. As noted above, the advantage of the data is, as De Sousa et al. (2012) point out, that internal and external flows are consistently comparable, as internal flows are represented by actual production data.²¹ Columns (2) and (4) show the estimates when using

²⁰Compare also Coughlin and Novy (2013) who argue along similar lines.

²¹See appendix D.4 for the estimations with IMF DOTS dataset. The magnitude of the effects is similar.

Dependent variable:				
log(flow)				
	(1)	(2)	(3)	(4)
log(distance)	-1.755*** (0.055)	-1.662*** (0.053)	-1.350*** (0.044)	-1.290*** (0.042)
border	2.311*** (0.337)	0.793** (0.363)	1.553*** (0.255)	0.982*** (0.263)
Estimator	OLS	OLS	OLS	OLS
Distance	arithmetic	harmonic	arithmetic	harmonic
Bias (AM/HM)	≥ median	≥ median	< median	< median
Observations	1,737	1,737	2,483	2,483
R ²	0.823	0.822	0.890	0.890
Adjusted R ²	0.801	0.800	0.881	0.881

Notes: All regression include exporter and importer fixed effects. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 4.4: Change in border coefficient by group with TradeProd data

harmonic mean distances as suggested above. For comparison, columns (1) and (3) report the coefficient when estimated with arithmetic mean distances.

Using the OLS estimator, harmonic mean distances reduce the border coefficient from 1.96 to 0.956 in 2000, which translates into a reduction of the border effect from a factor of about $\exp(1.96) \approx 7.1$ to $\exp(0.958) \approx 2.6$ for internal trade over external trade. When assuming a trade elasticity θ of -4 , as suggested by Head and Mayer (2014), the tariff-equivalent reduces from $\epsilon = \exp(1.96/4) - 1 = 63\%$ to 27% . For the PPML estimator the effect is smaller with a tariff-equivalent reduction from 68% to 54% , but significant nevertheless.

Table 4.4 shows the change in the estimated border coefficient conditional on the size of the bias in terms of the ratio of arithmetic over harmonic mean, as in figure 4.5a. Columns (1) and (2) show the coefficients for the same specification but restricting the sample on those exporting countries,

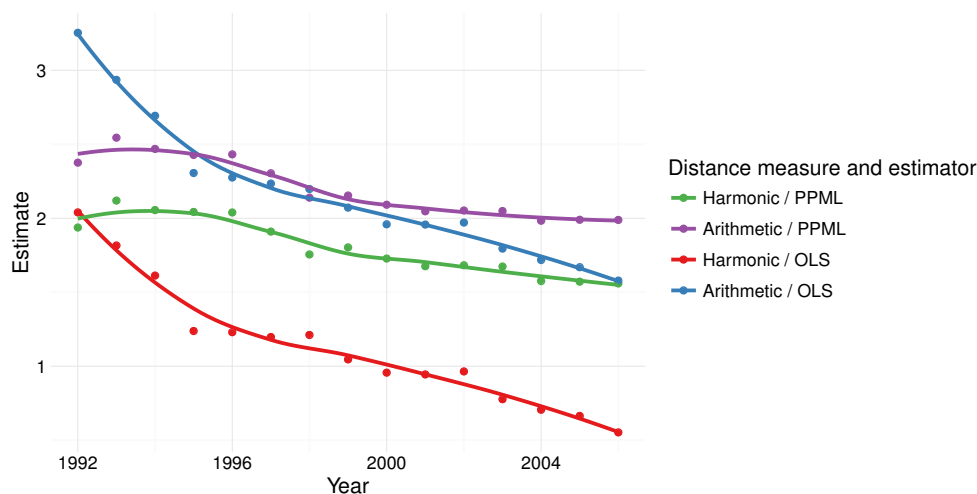


Figure 4.9: Gross border coefficients from cross section estimations using OLS and PPML estimators with TradeProd data.

whose bias is above the median, i.e. those countries with a strongly overstated internal distance. Conversely, columns (3) and (4) display those coefficients for the group with a bias lower than the median. The results confirm the intuition. Indeed, the estimated border coefficient drops by far more for the group with a higher bias (from 2.31 to 0.79) than with a lower bias (from 1.55 to 0.98).

Figure 4.9 displays the variation of the coefficient over time. The magnitude of the difference between using arithmetic and harmonic distances stays roughly the same for each estimator. Judging the results again by the framework set up in section 4.5, the applied tariff can be thought of as θ_{ϵ_l} , so that in 1992 for the OLS estimator and harmonic mean distances

$$\begin{aligned}\theta_{\epsilon_g} &= \theta (\epsilon_l + \epsilon_d) \\ \exp(2.01/4) &= 1.1189 + \epsilon_d\end{aligned}$$

and hence the share of unknown border impediments expressed in a tariff equivalent is equal to $(\epsilon_d - 1)/(\epsilon_g - 1) = 0.82$. In 2006 this has dropped to about 0.33.

The results are consistent with the literature on border effects that use disaggregated shipment data, like Hillberry and Hummels (2008). Their results suggest the border puzzle largely to be a statistical artifact due to aggregation. Hillberry and Hummels show that trade within a single 3-digit ZIP code region is on average three times higher than trade with partners outside the ZIP code. This suggests much shorter distances for internal trade flows than usually assumed with arithmetic mean distances. This statistical observation however is reflected in the use of the harmonic mean that gives short distances a proportionally larger weight than long distances. As shown above, using harmonic mean distances remedies the border puzzle to a large extent and reduces the share of dark costs down to 33 %, conditional on the estimation technique employed.

4.6.3 Effect on other Variables

The effect on other gravity variables is estimated separately from the border coefficient, as discussed above. Again estimating equations (4.10) and (4.11) in the cross section, but restricting to external trade, the difference between using arithmetic or harmonic distances is most visible in those variables that are correlated with distance. To mind comes here the dummy variable for neighboring countries. As seen above in section 4.5a, the bias of using arithmetic distances is particularly pronounced for those within countries or with neighboring countries, as the bias is itself a function of distance. Arithmetic distances are biased upwards, so that a dummy variable for trade with a neighboring country picks up the *ceteris paribus* too large trade flows. The use of harmonic distances corrects this: Giving more weight to short distances reduces the mean and accounts for the larger cross-border trade with neighbors compared to those in greater distance.

	Dependent variable:			
	log(flow)		flow	
	(1)	(2)	(3)	(4)
log(distance)	-1.379*** (0.028)	-1.338*** (0.027)	-0.578*** (0.015)	-0.521*** (0.013)
neighbor	0.266** (0.103)	0.099 (0.105)	0.372*** (0.024)	0.355*** (0.024)
rta	0.539*** (0.063)	0.550*** (0.063)	0.871*** (0.033)	0.903*** (0.033)
comcur	-0.061 (0.138)	-0.083 (0.138)	-0.088*** (0.030)	-0.119*** (0.030)
colony	0.808*** (0.093)	0.805*** (0.093)	-0.018 (0.027)	0.004 (0.027)
comlang off	0.485*** (0.054)	0.488*** (0.054)	0.143*** (0.027)	0.115*** (0.027)
comleg	0.242*** (0.038)	0.240*** (0.038)	0.169*** (0.018)	0.167*** (0.018)
Estimator	OLS	OLS	PPML	PPML
Distance	arithmetic	harmonic	arithmetic	harmonic
Observations	8,811	8,811	8,811	8,811
R ²	0.805	0.804		
Adjusted R ²	0.797	0.797		
Residual Std. Error (df = 8471)	1.308	1.310		

Notes: All regression include exporter and importer fixed effects. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 4.5: Gravity co-variates estimation with TradeProd data

Table 4.5 shows the estimates for the year 2000 and the TradeProd data for the most commonly used co-variates in the gravity equation: A dummy for trade between directly neighboring countries, the existence of a RTA, a common currency, historical colonial links, a common official language and the presence of a common legal system. Columns (1) and (3) show the coefficients for OLS and PPML estimates when using arithmetic mean distances, columns (2) and (4) those for the harmonic mean distances. The coefficient for trade with a neighboring country when using the latter over the former drops from 0.27, i.e. on average 30% more trade than with other countries, to an insignificant 0.1, or 10.5% more, when using

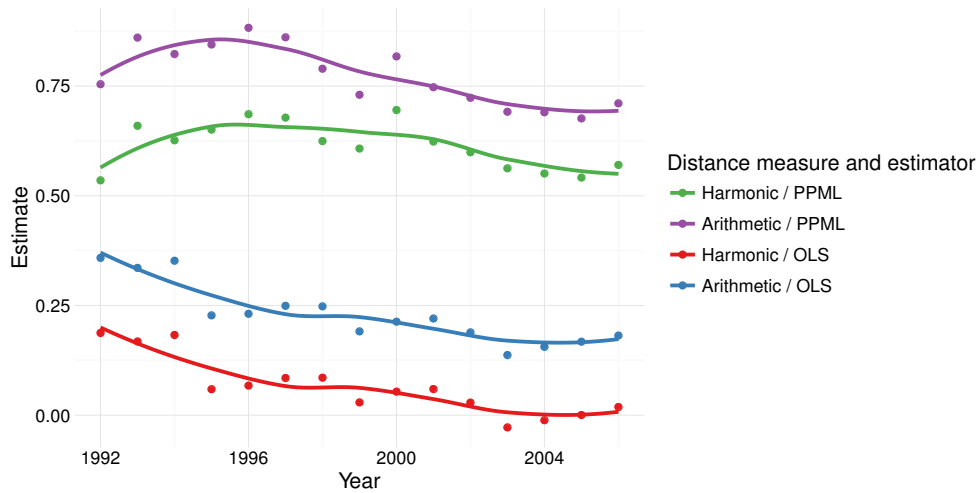


Figure 4.10: Neighbor coefficient over time by estimation method

the OLS estimator. When using the PPML estimator the coefficient drops from 45% to 42%, the decrease however is not significant.

Figure 4.10 shows the evolution of the coefficient from 1992 to 2006. Again, as in the case of the border coefficient, the difference between the estimated coefficient using the two distance measures remains relatively stable. Unsurprisingly the other variables are largely unaffected, as they tend to be less correlated with distance.

4.6.4 Gauging the Effects on Simulated Data

In order to further validate the theoretical and empirical findings as well as their magnitude, I perform a simulation exercise. I first generate data using a simple structural gravity model à la Head and Mayer (2014) in which I explicitly set the bilateral trade costs, in this case solely to be described by distance. Knowing the *true* distance elasticity, I estimate the distance coefficient using both *correct* and *mismeasured* distances. Furthermore I can introduce additional variables in the estimation that are orthogonal to the *true* distance, but may not be to the *mismeasured*

ones, as is hypothesized above about the border and neighboring country dummies. In case the econometric results from above are correct, they should be replicable in this simulated environment.

Suppose now that bilateral trade flows X_{ij} are described by

$$X_{ij} = \frac{Y_i}{\Omega_i} \cdot \frac{X_j}{\Phi_j} \cdot \phi_{ij} \quad (4.12)$$

where $Y_i = \sum_j X_{ij}$ is the value of production in i , $X_j = \sum_i X_{ij}$ is the value of all imports in j , and

$$\Omega_i = \sum_k \frac{X_k \phi_{ik}}{\Phi_k} \quad \text{and} \quad \Phi_j = \sum_k \frac{Y_k \phi_{jk}}{\Omega_k}$$

are the multilateral resistance terms. As Fally (2015) notes, these can be solved for a given set of trade costs ϕ_{ij} , production and expenditure figures. Assuming that both Y_k and X_k can be proxied for by data on GDP, I can easily simulate real-world trade data by specifying trade costs ϕ_{ij} .

Suppose therefore for the purpose of the argument that bilateral trade costs ϕ_{ij} were to be governed exclusively by the bilateral geographic distance between i and j , such that

$$\phi_{ij} = \exp(\delta \cdot \ln \text{Dist}_{ij}(\delta))$$

where Dist_{ij} is the *harmonic mean* distance for $\delta = -1$. Conveniently equation (4.12) can be estimated as

$$\log(X_{ij}) = F_i + F_j + \hat{\delta} \cdot \ln(\text{Dist}_{ij}(\delta)) + \hat{\gamma} \cdot z_{ij} + \epsilon_{ij}$$

where F_i and F_j are fixed effects capturing all exporter and importer characteristics and z_{ij} is an additional bilateral variable. The coefficients of interest are $\hat{\delta}$, the estimated distance elasticity which is supposed to be equal to δ when estimated with the correct distance measure, and $\hat{\gamma}$,

	Dependent variable:					
	log(trade_flow)			trade_flow		
	(1)	(2)	(3)	(4)	(5)	(6)
log(distance_harm)	-1.000*** (0.000)				-1.000*** (0.000)	
log(distance_arith)		-1.075*** (0.001)	-1.028*** (0.001)	-1.015*** (0.001)		-1.077*** (0.001)
border	0.000*** (0.000)		1.136*** (0.006)	1.185*** (0.006)	-0.000** (0.000)	0.541*** (0.003)
neighbor	0.000*** (0.000)			0.171*** (0.003)	0.000 (0.000)	0.108*** (0.002)
Estimator	OLS	OLS	OLS	OLS	PPML	PPML
Observations	32,041	32,041	32,041	32,041	32,041	32,041
R ²	1.000	0.999	1.000	1.000		
Adjusted R ²	1.000	0.999	1.000	1.000		

Notes: All regression include exporter and importer fixed effects. Significance levels: *: $p < 0.1$, **: $p < 0.05$, ***: $p < 0.01$.

Table 4.6: Gravity co-variates estimation with simulated data

which is supposed to be zero, as ϕ_{ij} is only governed by distance. In case of a mismeasurement of the distance, $\hat{\gamma}$ could be non-zero, in which case z_{ij} were to capture some of the distance effect. As discussed above, of particular interest here are the variables capturing the border and neighboring country effect. Both variables are correlated with distance to some degree and therefore could capture distance effects.

Table 4.6 reports the estimated coefficients for a variety of specifications: Columns (1) and (5) show the benchmark result in which the *correct* harmonic mean distances are used, estimated using an OLS or PPML estimator respectively. The distance coefficient is, as expected, -1 . The coefficients for the border and neighboring country variable are both 0. Columns (2) - (4) and (6) report the corresponding estimates when erroneously using the *mismeasured* arithmetic mean distances: In all cases the distance coefficient is biased upwards, i.e. away from zero. Remarkably, the estimated border coefficients stand at more than 1.1 for the OLS estimator and more than 0.5 using the PPML estimator, although its true value is 0. The neighboring country coefficient yields about 0.2 and 0.1, respectively.

The consequences of using mismeasured distances, i.e. a substantially inflated border coefficient as well as an overestimated neighboring country coefficient, are replicated by using simulated data. Moreover the magnitude of the effects are validated. The use of mismeasured distances leads to a severe overestimation of the border and neighboring country coefficients, or in other words, using the correct—harmonic mean—distances helps remedy the border puzzle of international trade.

4.7 Conclusion

In this chapter I derive a trade cost aggregation from a very general representation of structural gravity that takes into account location- and entity-specific trade costs. The method, building on earlier work from Head and Mayer (2009), is agnostic to the underlying micro-foundation of the gravity framework and yields specific instructions on data and computation. Specifically and most importantly, it yields an aggregation in the form of a generalized mean of location-specific trade costs where the exponent is equal to the elasticity of trade to these trade costs in the gravity model.

I then apply the procedure to the arguably most acknowledged proxy for location-specific trade costs, distances. Using annual high resolution satellite nighttime imagery for the calculation of the weights, I compute bilateral distances for all country pairs (including within-country) and all years between 1992 and 2012. The data significantly improves upon previously used human-collected figures with much broader and finer coverage and the absence of mismeasurement. Additionally, the annual periodicity allows to take into account changes in the economic geography of countries, which are particularly prevalent in developing and emerging economies. The time dimension of the computed distances allows me to estimate the required distance elasticity from the gravity model in the

within-dimension of the panel. This in turn ensures that time-invariant, potentially distance-correlated bilateral characteristics are controlled for. The estimated coefficient in the preferred estimation conveniently very close to the traditional estimate of -1 , is then used for the aggregation.

I show that with these harmonic mean distances, as opposed to the customary use of arithmetic mean distances, the border puzzle of international trade becomes much less severe or even disappears, depending on the data and estimation technique employed. This result is driven by the fact that arithmetic mean distances strongly overstate short distances relative to harmonic mean distances. It is consistent with the literature suggesting that the border puzzle generally disappears when using disaggregated data on volume and distance of shipment, such as in Hillberry and Hummels (2008). Regressions using simulated data confirm the theoretical and empirical findings and support the magnitude of the estimated effects.

The results strongly suggest the use of these harmonic mean distances over the de-facto standard of arithmetic mean distances. The new distance measure also warrants an evaluation on the effect of national and subnational borders in the initial spirit of McCallum (1995) and recently Coughlin and Novy (2013), testing the results of this chapter on less aggregated flows.

Conclusion

The subject of this doctoral thesis revolves around the analysis of the links between international trade and foreign policy, along with a chapter that addresses a general methodological question. In the first two chapters I look at the use of certain instruments of trade policy—economic integration and sanctions—for the purpose of foreign policy objectives. The third chapter aims to shed light on a potential mechanism that drives the impact of political relations on bilateral international trade, pointing to the importance of critical inputs. Finally, in the fourth chapter, I address the methodological question of how trade costs *should* be aggregated with respect to an underlying gravity framework and I compute a new measure of theory-consistent distances using satellite imagery. Each of the chapters contributes to the literature in international trade along multiple lines. Chapters 1 and 3 feature stylized models that exhibit two mechanisms that so far have not been explicitly formalized in the literature. Chapters 2 and 4 include two methodological contributions to the gravity model of international trade. Finally, in chapters 1, 3 and 4 I make use of several new sources of arguably “big” and “small” data—from an event dataset of more than 300 million political events to one on the summoning or withdrawal of high-level diplomats—that have so far not been used in the literature on international trade.

Chapter 1 is situated at the intersection of the literature in international trade and international political economy. Here, I aim to show that aside from traditional economic incentives for economic integration, some agree-

ments may also have their political determinants. Building on a modified version of a model that allows for non-traditional determinants of preferential trade agreements, I demonstrate how an economically big country may weigh economic against political motivations for integration, while a smaller country may be indifferent between possible partner countries at the same time. In the empirical section of chapter 1, I test these predictions with proxies for economic and political motivations for integration. The economic motivation is proxied by *non-realized* trade gains computed using general equilibrium counterfactuals from a gravity framework. The political motivation is proxied by two new indices to describe the state of political relations between two countries using a vast dataset of more than 300 million political events. The econometric results are in line with the predictions of the model and underline that geopolitical consideration may indeed influence the geography of economic integration agreements.

In chapter 2, Matthieu Crozet and I analyze the recent case of sanctions on the Russian Federation. The chapter sets itself apart from the existing literature on sanctions by studying their impact on the *sender* country's economy. We shed light on the importance of possible "collateral damage" of this tool of foreign policy and assess the effects of the sanctions from two angles: Using monthly trade data from major exporting countries, we evaluate the global impact on exports to the Russian Federation in a structural gravity framework and compute theory-consistent general equilibrium counterfactuals that rely only on data on observed trade flows. The overall "lost trade" due to the sanctions is estimated at US\$60.2 billion from the beginning of the conflict until mid-2015, with 76.7% being borne by EU countries. One important result is that products embargoed by the Russian Federation make up only a small portion of the total loss. This suggests that indeed most of the impact of the diplomatic conflict on exports can be considered "collateral damage". In order to explore the mechanisms at the micro level, we evaluate the impact of the sanctions regime using monthly French firm-level data. We find that the sanctions have decreased the individual firm's probability of exporting to Russia, the

value of shipments, and their price. The strained provision of trade finance instruments as a result of the financial sanctions levied on Russian institutions is found to best explain the stark decrease in French firms' exports.

In chapter 3, a joint work with Elsa Leromain, we explore the links between foreign policy and trade flows from another perspective. We contribute to the literature on non-traditional determinants of trade flows that has consistently shown a connection between bilateral political relations and the value of exchanged goods. We propose a mechanism through which this effect could be heterogeneous along the lines of the dependence of the importing economy on certain critical inputs. In the theoretical part of the chapter we develop a stylized model that illustrates this mechanism. The rationale for the heterogeneity of the effect is rooted in a greater impact on the economy from a price shock to critical inputs than from other inputs, due to strong domestic linkages. From the model we can derive a measure of *dependence* for each country-product pair that, once computed with data from input-output tables from all major economies, allows us to test the model's predictions in reduced form. We address potential endogeneity concerns by conducting an event study. We exploit the summoning and recalling of high-level diplomats as an exogenous shock to political relations and study the reaction of trade flows. The results from the empirical exercise support the proposed mechanism outlined in the theoretical part of the chapter. Political relations indeed do matter in the choice of the sourcing partner for today's interdependent economies and, importantly, more so for critical products the importing economy is dependent on.

Chapter 4 addresses the methodological question of how to aggregate trade costs and introduces a new measure of distance. Starting out from a general representation of the gravity equation of international trade, I derive a trade cost aggregation that is agnostic to the underlying micro-foundations, but yields concrete instructions on the method of computation and data to

be used. Importantly, the estimated trade cost coefficient from a gravity equation serves also as a parameter in the respective trade cost aggregation itself. Then, in the empirical part, I apply this trade cost aggregation to distances between and within countries using nighttime satellite imagery for information on the geography of economic activity within countries. The data eliminates the measurement error of human-collected population figures and drastically increases the coverage to virtually all inhabited and economically active areas in very fine detail. An additional benefit of using this satellite data is its annual periodicity that allows me to compute time-varying distances for each year and country pair since 1992. I show how this new measure of distance provides an additional remedy to the border puzzle of international trade, as other measures vastly overstate short distances.

The four chapters of this thesis collectively aim to contribute to the understanding of how international trade and trade policy are shaped by non-traditional determinants. I analyze the impact of two instruments of commercial policy that are commonly used in connection with political objectives, economic integration and sanctions, and explore new ways to quantify traditional and non-traditional determinants of trade with the help of new and vast datasets. By addressing the research questions posed in this thesis, new ones come up that warrant to be addressed in future work. The combination of increasingly accessible troves of “big data” and close attention to the theoretical foundations in the literature on international trade appears to hold the key to answering these questions.

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Appendix A

Geopolitical Motivations for Economic Integration

A.1 Data on Economic Integration Agreements

FTA Industrial	Tariff liberalization on industrial goods; elimination of non tariff measures
FTA Agriculture	Tariff liberalization on agriculture goods; elimination of non-tariff measures
Customs	Provision of information; publication on the Internet of new laws and regulations; training
Export Taxes	Elimination of export taxes
SPS	Affirmation of rights and obligations under the WTO Agreement on SPS; harmonization of SPS measures
TBT	Affirmation of rights and obligations under WTO Agreement on TBT; provision of information; harmonization of regulations; mutual recognition agreements
STE	Establishment or maintenance of an independent competition authority; nondiscrimination regarding production and marketing condition; provision of information; affirmation of Art XVII GATT provision
AD	Retention of Antidumping rights and obligations under the WTO Agreement (Art. VI GATT).
CVM	Retention of Countervailing measures rights and obligations under the WTO Agreement (Art VI GATT)
State Aid	Assessment of anticompetitive behaviour; annual reporting on the value and distribution of state aid given; provision of information
Public Procurement	Progressive liberalisation; national treatment and/or non-discrimination principle; publication of laws and regulations on the Internet; specification of public procurement regime
TRIMs	Provisions concerning requirements for local content and export performance of FDI
GATS	Liberalisation of trade in services
TRIPs	Harmonisation of standards; enforcement; national treatment, most-favoured nation treatment

Table A.1: Description of provisions as in World Trade Organization (2011)

A.2 General Equilibrium Counterfactuals

Counterfactual trade flows for any setting of \mathbf{d}'_{odt} can be computed as

$$\hat{X}_{odt} = \frac{\hat{Y}_{ot}(\mathbf{d}'_{odt})}{\hat{\Pi}_{ot}(\mathbf{d}'_{odt})^{1-\sigma}} \frac{\hat{E}_{dt}(\mathbf{d}'_{odt})}{\hat{P}_{dt}(\mathbf{d}'_{odt})^{1-\sigma}} \hat{\tau}_{odt}(\mathbf{d}'_{odt})^{1-\sigma}$$

The computation of the separate terms takes separate steps that are iteratively repeated until convergence, similar to the procedure described by Anderson et al. (2015). Following section 2.3.3, current pseudo-production and expenditure figures can be retrieved from the estimated fixed effects as

$$\begin{aligned} \hat{Y}_{ot}^{\text{current}} &= \sum_{l \in d} \exp(\hat{\Xi}_{ot} + \hat{\Theta}_{lt} + \hat{\tau}_{olt}) \quad \text{and analogously} \\ \hat{X}_{dt}^{\text{current}} &= \sum_{l \in o} \exp(\hat{\Xi}_{lt} + \hat{\Theta}_{dt} + \hat{\tau}_{ldt}) \end{aligned}$$

while current inward and outward multilateral resistance terms can be constructed as

$$\begin{aligned} \hat{\Pi}_{ot}^{\text{current}} &= \sum_{l \in d} \exp(\hat{\Theta}_{lt} + \hat{\tau}_{olt}) \quad \text{and} \\ \hat{P}_{dt}^{\text{current}} &= \sum_{l \in o} \exp(\hat{\Xi}_{lt} + \hat{\tau}_{ldt}) \end{aligned}$$

The respective multilateral resistance terms under the new global trade cost matrix $\hat{\tau}_t(\mathbf{d}'_{odt})$ can be determined via a contraction mapping algorithm, i.e. iteratively solving the following system of matrix equations:

$$\begin{aligned} \hat{\Pi}_t^{1-\sigma} &= \hat{\tau}_t(\mathbf{d}'_{odt}) \left(\hat{X}_t \otimes \hat{P}_t^{-\sigma} \right) \\ \hat{P}_t^{1-\sigma} &= \hat{\tau}_t(\mathbf{d}'_{odt})^T \left(\hat{Y}_t \otimes \hat{\Pi}_t^{-\sigma} \right) \end{aligned}$$

where $\hat{\Pi}_t^{1-\sigma}$ and $\hat{P}_t^{1-\sigma}$ are vectors of outward and inward multilateral resistances at time t . $\hat{\Pi}_t^{-\sigma}$ and $\hat{P}_t^{-\sigma}$ are vectors of elementwise inverses

of $\hat{\Pi}_t^{1-\sigma}$ and $\hat{P}_t^{1-\sigma}$, and \otimes denotes the elementwise product.¹ Changes in the production and expenditures of exporters and importers due to the new trade costs are computed using first-order price adjustments using equation (1.12)

$$\hat{Y}_{ot} = \hat{Y}_{ot}^{\text{current}} \cdot \left(\frac{\hat{\Omega}_{ot}}{\hat{\Omega}_{ot}^{\text{current}}} \right)^{\frac{1}{1-\sigma}} \quad \text{and} \quad \hat{X}_{dt} = \hat{X}_{dt}^{\text{current}} \cdot \left(\frac{\hat{\Omega}_{dt}}{\hat{\Omega}_{dt}^{\text{current}}} \right)^{\frac{1}{1-\sigma}}$$

where σ is the elasticity of substitution.

¹Alternatively, Anderson et al. (2015) show that the PPML estimator yields correct multilateral resistance terms with observed trade flows and counterfactual trade costs.

A.3 Descriptive Statistics for Economic Data

Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
Afghanistan	156.39	8.00	0.03	0.58	4300.05	5	2	0
Albania	403.78	0.00	0.00		2207.12	3	0	0
Algeria	26171.45	14.00	0.06	0.69	3644.27	6	48	0
Andorra	0.06	0.00	0.00		10353.61	0	0	0
Angola	8046.29	19.00	0.07	0.54	4881.28	2	7	0
Antigua and Barbuda	134.76	14.00	0.06	0.50	2911.14	0	35	5
Argentina	29279.61	11.00	0.02	0.39	7803.75	5	22	0
Armenia	332.61	7.00	0.01	0.20	2447.61	4	0	0
Aruba	1991.89	0.00	0.00		3061.22	0	24	1
Australia	72313.58	10.00	0.01	0.17	10790.27	0	60	3
Austria	74761.90	41.00	0.16	0.73	2496.25	7	3	10
Azerbaijan	2309.07	11.00	0.04	0.52	3074.45	5	0	0
Bahamas	963.22	14.00	0.05	0.50	4990.64	0	47	4
Bahrain	3222.26	5.00	0.00	0.15	3318.15	0	21	0
Bangladesh	6532.35	4.00	0.01	0.27	5294.44	2	0	0
Barbados	353.95	14.00	0.04	0.50	3256.45	0	52	0
Belarus	8165.63	0.00	0.00		2898.65	5	0	0
Belgium	201647.29	41.00	0.15	0.73	2969.30	3	41	10
Belize	351.70	14.00	0.05	0.50	4467.28	2	65	0
Benin	318.56	15.00	0.02	0.15	3322.99	4	30	13
Bermuda	815.31	0.00	0.00		5704.57	0	44	4
Bhutan	29.93	0.00	0.00		5520.63	2	0	1
Bolivia	1720.96	11.00	0.03	0.36	6930.64	5	22	0
Bosnia and Herzegovina	736.54	0.00	0.00		1647.22	1	1	0
Botswana	779.68	0.00	0.00		5615.98	2	37	0
Brazil	64786.62	11.00	0.02	0.39	7424.14	9	7	0
Brunei Darussalam	3795.62	9.00	0.02	0.23	6392.07	1	1	0
Bulgaria	5518.57	19.00	0.08	0.77	2711.34	5	0	0
Burkina Faso	182.08	15.00	0.02	0.15	3473.58	6	30	13

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Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
Burundi	84.82	20.00	0.08	0.55	3727.02	3	29	0
Cabo Verde	20.76	14.00	0.02	0.15	4781.75	0	7	0
Cambodia	1506.51	9.00	0.01	0.23	5331.21	3	0	0
Cameroon	2663.59	9.00	0.01	0.23	3907.45	6	74	13
Canada	318268.26	4.00	0.02	0.80	7490.79	1	87	0
Central African Republic	248.64	7.00	0.01	0.23	4160.18	5	30	13
Chad	94.37	6.00	0.01	0.23	3857.42	6	35	12
Chile	21524.17	14.00	0.04	0.50	8663.01	3	22	0
China	408498.47	1.00	0.00	0.15	6774.69	16	5	0
Colombia	15088.48	24.00	0.03	0.23	5405.97	5	23	0
Comoros	16.87	12.00	0.07	0.65	5081.25	0	31	0
Congo	3473.47	9.00	0.01	0.23	4204.01	4	29	13
Costa Rica	8101.66	7.00	0.02	0.54	4675.68	2	21	0
Cote d'Ivoire	4628.83	15.00	0.01	0.15	4091.15	5	34	13
Croatia	4459.57	2.00	0.01	0.79	2321.67	3	1	0
Cuba	1722.33	11.00	0.01	0.15	4884.04	0	21	0
Cyprus	1634.62	14.00	0.02	0.31	2922.96	0	2	0
Czech Republic	32396.40	23.00	0.10	0.84	2621.36	4	0	0
Denmark	56414.57	41.00	0.16	0.73	3189.35	1	2	2
Djibouti	166.72	14.00	0.08	0.65	3697.95	2	37	0
Dominica	100.24	14.00	0.05	0.50	2897.19	0	60	5
Dominican Republic	6430.28	0.00	0.00		3898.43	1	22	0
Ecuador	6517.72	11.00	0.02	0.22	6091.94	2	21	0
Egypt	6359.24	32.00	0.10	0.58	3364.09	3	22	0
El Salvador	3460.10	6.00	0.02	0.48	3955.58	2	21	0
Equatorial Guinea	1186.48	4.00	0.01	0.23	3677.61	2	36	10
Eritrea	12.15	6.00	0.06	0.65	3719.54	1	15	0
Estonia	5532.71	24.00	0.08	0.58	3214.93	2	0	0
Ethiopia	537.72	15.00	0.06	0.65	4156.55	4	41	0
Falkland Islands	92.91	0.00	0.00		10452.34	0	23	1
Faroe Islands	431.36	18.00	0.09	0.53	3759.97	0	2	2
Fiji	668.66	10.00	0.01	0.13	8677.68	0	48	0

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Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
Finland	51358.82	41.00	0.15	0.73	3664.50	3	1	10
France	350248.92	41.00	0.15	0.73	3364.93	5	35	10
French Polynesia	210.44	15.00	0.06	0.50	11147.16	0	24	1
Gabon	3926.72	8.00	0.01	0.23	3765.45	3	30	12
Gambia	50.77	15.00	0.02	0.15	3440.86	1	40	0
Georgia	647.71	5.00	0.01	0.27	2827.96	4	0	0
Germany	599401.28	41.00	0.15	0.73	2965.41	8	3	10
Ghana	1502.78	15.00	0.01	0.15	3761.79	3	46	0
Gibraltar	120.86	0.00	0.00		3467.88	1	53	1
Greece	12443.24	41.00	0.16	0.73	3051.48	4	1	0
Greenland	359.09	0.00	0.00		6039.51	0	2	2
Grenada	90.41	14.00	0.06	0.50	2399.28	0	36	5
Guatemala	4996.62	6.00	0.02	0.47	4412.29	4	21	0
Guinea	1118.99	15.00	0.02	0.15	3612.54	6	30	0
Guinea-Bissau	122.99	14.00	0.02	0.15	3134.60	2	7	11
Guyana	652.87	14.00	0.04	0.50	4487.70	3	46	0
Haiti	356.38	0.00	0.00		3792.96	1	25	0
Honduras	4226.84	6.00	0.02	0.47	3985.36	3	21	0
Hong Kong	217407.10	0.00	0.00		4244.13	1	59	0
Hungary	33497.15	22.00	0.09	0.71	2356.21	7	0	0
Iceland	2538.66	28.00	0.13	0.83	5144.67	0	0	0
India	50659.97	6.00	0.01	0.25	5484.45	6	58	1
Indonesia	75524.51	9.00	0.01	0.23	7677.60	2	0	0
Iran	26170.76	10.00	0.03	0.53	3733.87	7	2	0
Iraq	16407.70	0.00	0.00		3360.26	6	21	0
Ireland	84867.37	41.00	0.16	0.73	3958.75	1	56	10
Israel	33658.31	26.00	0.12	0.76	3056.14	2	51	0
Italy	261425.00	41.00	0.15	0.73	3049.55	4	1	10
Jamaica	1791.02	14.00	0.04	0.50	4685.07	0	48	0
Japan	550162.87	0.00	0.00		7845.51	0	0	0
Jordan	1946.78	1.00	0.00	0.54	2611.53	4	22	0
Kazakhstan	11830.54	12.00	0.04	0.50	4624.49	5	2	0

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Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
Kenya	2218.84	19.00	0.07	0.65	4271.89	5	49	0
Kiribati	23.20	7.00	0.01	0.12	9320.60	0	27	1
Kuwait	20629.09	5.00	0.00	0.15	3472.45	2	21	0
Kyrgyzstan	624.50	13.00	0.06	0.48	3814.06	4	2	0
Laos	339.32	12.00	0.02	0.25	5179.90	5	0	0
Latvia	3321.87	23.00	0.09	0.66	2816.62	4	0	0
Lebanon	976.23	0.00	0.00		2923.49	1	48	0
Lesotho	179.73	11.00	0.06	0.63	5704.66	1	34	1
Liberia	643.88	15.00	0.02	0.15	3874.11	3	43	3
Libya	13988.68	0.00	0.00		3400.13	6	20	0
Lithuania	4625.17	23.00	0.09	0.66	2853.97	4	0	0
Luxembourg	10.28	0.00	0.00		9609.76	0	0	0
Macao	3478.14	0.00	0.00		4085.88	1	11	0
Macedonia	1641.05	4.00	0.02	0.71	2311.71	4	0	0
Madagascar	1000.34	18.00	0.07	0.65	5934.00	0	34	0
Malawi	417.50	15.00	0.07	0.65	4866.94	3	44	0
Malaysia	124834.62	9.00	0.01	0.23	6502.71	4	6	1
Maldives	1003.63	0.00	0.00		5769.34	0	0	0
Mali	253.03	15.00	0.02	0.15	3695.86	7	28	12
Malta	2949.51	14.00	0.02	0.31	3264.38	0	49	0
Marshall Islands	0.04	0.00	0.00		5524.33	0	0	0
Mauritania	575.57	15.00	0.02	0.15	4115.48	3	20	0
Mauritius	1818.45	19.00	0.07	0.65	6606.50	0	79	0
Mexico	192230.85	32.00	0.10	0.53	7570.14	3	22	0
Moldova	856.00	2.00	0.00	0.17	2391.56	2	1	0
Mongolia	603.09	0.00	0.00		5845.27	2	0	0
Morocco	9111.25	17.00	0.06	0.68	3978.57	1	49	0
Mozambique	467.34	16.00	0.07	0.65	5214.31	6	7	0
Myanmar	1957.95	9.00	0.01	0.23	5439.99	5	0	0
Namibia	597.33	12.00	0.06	0.63	6320.61	2	36	1
Nauru	33.09	6.00	0.01	0.12	9503.28	0	31	1
Nepal	870.66	1.00	0.00	0.08	5093.32	2	0	0

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Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
Netherlands	252475.32	41.00	0.15	0.73	2983.18	2	4	10
Netherlands Antilles	2620.13	15.00	0.05	0.50	3716.05	0	24	1
New Caledonia	605.09	15.00	0.06	0.50	8247.51	0	22	1
New Zealand	15217.27	11.00	0.01	0.20	11291.74	0	58	0
Nicaragua	1063.18	6.00	0.02	0.51	4058.11	2	21	0
Niger	504.69	15.00	0.02	0.15	3851.15	7	46	13
Nigeria	31582.78	15.00	0.01	0.15	3828.19	4	46	0
North Korea	1073.75	0.00	0.00		6473.91	3	1	0
Norway	70206.55	29.00	0.13	0.79	3661.40	3	0	0
Oman	12162.30	5.00	0.00	0.15	3992.97	3	22	0
Pakistan	10239.72	9.00	0.03	0.58	4855.16	4	53	0
Palau	4.77	0.00	0.00		6032.65	0	10	0
Panama	2658.44	5.00	0.01	0.46	4844.70	2	21	4
Papua New Guinea	2093.35	8.00	0.01	0.15	9372.25	1	42	0
Paraguay	1275.32	11.00	0.03	0.39	7348.81	3	22	0
Peru	7879.62	11.00	0.01	0.22	7343.59	5	23	0
Philippines	48992.16	9.00	0.01	0.23	7237.07	0	56	0
Poland	35091.51	22.00	0.08	0.70	2837.48	7	0	0
Portugal	27461.34	41.00	0.16	0.73	4180.37	1	7	10
Qatar	12744.36	5.00	0.01	0.15	3085.68	2	22	1
Russian Federation	130665.41	4.00	0.01	0.24	4557.13	14	2	0
Rwanda	71.78	19.00	0.08	0.54	3490.07	4	60	0
Saint Helena, Ascension and Tristan da Cunha	8.97	0.00	0.00		6623.14	0	25	1
Saint Kitts and Nevis	60.29	14.00	0.06	0.50	3972.09	0	31	5
Saint Lucia	92.87	14.00	0.06	0.50	2114.77	0	38	5
Saint Pierre and Miquelon	15.78	15.00	0.08	0.50	5512.47	0	17	10
Saint Vincent and the Grenadines	175.48	14.00	0.05	0.50	2195.23	0	40	5
Samoa	69.11	6.00	0.01	0.12	10064.85	0	34	0
San Marino	0.10	0.00	0.00		9528.64	0	0	0
Sao Tome and Principe	20.15	5.00	0.01	0.23	3705.99	0	7	0

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Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
Saudi Arabia	82230.75	5.00	0.00	0.15	3934.81	7	22	0
Senegal	773.40	15.00	0.01	0.15	3746.36	5	32	13
Seychelles	193.38	0.00	0.00		5491.91	0	65	0
Sierra Leone	136.18	13.00	0.01	0.15	3764.61	2	41	0
Singapore	152595.32	10.00	0.02	0.28	6535.41	1	54	1
Slovakia	13262.53	23.00	0.10	0.81	2450.20	5	0	0
Slovenia	9982.39	24.00	0.09	0.67	2372.77	4	0	0
Solomon Islands	100.39	7.00	0.01	0.13	8601.56	0	29	0
Somalia	129.19	0.00	0.00		4590.68	3	64	0
South Africa	34686.95	14.00	0.06	0.73	6703.77	2	52	0
South Korea	195182.94	4.00	0.01	0.27	6747.31	1	1	0
Spain	117218.98	41.00	0.15	0.73	3858.62	3	23	10
Sri Lanka	6329.34	4.00	0.01	0.32	6149.86	0	0	0
Sudan	1779.19	15.00	0.06	0.65	4150.52	8	21	0
Suriname	548.21	14.00	0.05	0.50	4702.43	2	5	0
Swaziland	332.64	15.00	0.07	0.63	5511.38	2	41	1
Sweden	98344.93	41.00	0.15	0.73	3425.57	2	1	0
Switzerland	107694.35	29.00	0.09	0.58	3008.86	4	38	0
Syrian Arab Republic	5096.58	14.00	0.04	0.42	2778.37	5	19	0
Taiwan	110140.40	0.00	0.00		7112.06	0	3	0
Tajikistan	937.93	9.00	0.05	0.58	3368.10	4	0	0
Tanzania	1009.52	20.00	0.07	0.65	4585.69	8	55	0
Thailand	80319.86	9.00	0.01	0.24	5717.87	4	0	0
Togo	267.63	15.00	0.02	0.15	3319.73	3	30	13
Tonga	19.20	7.00	0.01	0.12	8854.93	0	32	0
Trinidad and Tobago	4430.63	14.00	0.04	0.50	3585.56	0	49	0
Tunisia	6823.74	14.00	0.05	0.62	3343.37	2	49	0
Turkey	30029.28	37.00	0.13	0.67	3202.07	8	1	0
Turkmenistan	3754.48	12.00	0.06	0.50	3293.29	4	0	0
Tuvalu	0.70	5.00	0.01	0.12	9179.50	0	0	1
Uganda	630.90	15.00	0.07	0.65	4060.47	5	44	0
Ukraine	17306.56	9.00	0.01	0.24	3258.76	7	0	0

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Table A.2: Descriptive statistics for COMTRADE exports and EIA data

Country	Total trade (in Million USD)	Number EIAs	Mean depth EIA	Mean depth EIA (Depth > 0)	Harmonic mean distance	Countries w/ shared border	Countries w/ common language	Countries w/ common currency
United Arab Emirates	38868.85	5.00	0.00	0.15	3747.51	3	21	1
United Kingdom	317484.74	41.00	0.15	0.73	3572.52	1	60	3
United States	900549.20	3.00	0.01	0.82	7663.99	2	59	4
Uruguay	2880.38	11.00	0.03	0.39	7586.29	2	21	0
Uzbekistan	2399.03	9.00	0.05	0.53	3340.00	4	0	0
Vanuatu	98.07	7.00	0.01	0.13	7723.37	0	43	0
Venezuela	36975.66	24.00	0.04	0.30	4191.32	3	21	0
Viet Nam	16588.35	9.00	0.01	0.23	5722.70	3	0	0
Yemen	4786.66	0.00	0.00		3952.35	2	22	0
Yugoslavia	1321.71	0.00	0.00		1971.87	5	0	0
Zambia	1300.72	19.00	0.07	0.65	4716.18	8	48	0
Zimbabwe	2261.92	19.00	0.07	0.65	4871.40	4	52	0

A.4 Descriptive Statistics for Political Data

As Ulfelder (2013) and Masad (2013) illustrate, machine-coded event data is very rich, but prone to noise, numerous biases, e.g. “media fatigue” (Gerner and Schrod, 1998), and errors due to imperfect algorithms. Yonamine (2011) provides a good overview on how to overcome these issues and gives advice on aggregation methods. For the present paper, I use the so-called GDEL T backfiles, as opposed to the much smaller and ready-made GDEL T subset available. See Leetaru and Schrod (2013) for a detailed description of the data. I exclude all intra-state events and use only those that are “root events”. Further, I use the median number of articles per event for by month and country pair as a threshold and only include those events with higher or equal number of articles.

Table A.3: Descriptive statistics for political data based on GDEL T

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Afghanistan	3776	65.10	142	0.02	PAK	CAN	0.17	GRC	SDN
Albania	2514	54.65	154	0.02	MKD	CHL	0.11	TUR	MNE
Algeria	2980	33.48	111	0.01	FRA	BFA	0.28	NLD	THA
Angola	3222	41.31	122	0.01	ZMB	CYP	0.24	LBR	PER
Antigua and Barbuda	12	4.00	197	0.12	USA	FRA	0.28	FRA	GBR
Argentina	1887	36.29	148	0.02	BRA	ARM	0.24	PAK	SLV
Armenia	2915	55.00	147	0.02	RUS	ARG	0.31	BGR	TUR
Australia	5060	48.65	96	0.01	IDN	BWA	0.23	DNK	MDV
Austria	4082	52.33	122	0.01	CZE	FSM	0.23	FSM	PSE
Azerbaijan	3471	73.85	153	0.02	RUS	CAN	0.27	NLD	AFG
Bahamas	82	10.25	192	0.10	USA	BRB	0.15	CHE	DEU
Bahrain	1062	28.70	163	0.03	QAT	BEL	0.31	JPN	ETH

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Bangladesh	1402	23.76	141	0.02	USA	DZA	0.28	SWE	TLS
Barbados	61	5.55	189	0.08	GBR	BHS	0.34	BLZ	GBR
Belarus	3042	59.65	149	0.02	RUS	GEO	0.29	IND	FIN
Belgium	3859	36.07	93	0.01	AUT	ARE	0.25	LBN	KHM
Belize	333	18.50	182	0.05	GTM	BRB	0.39	BRB	RUS
Benin	390	9.51	159	0.02	NGA	CAF	0.30	RWA	IND
Bermuda	50	4.55	189	0.08	USA	PER	0.34	CAN	NZL
Bhutan	207	23.00	191	0.10	NPL	FSM	0.19	CHN	PAK
Bolivia	518	20.72	175	0.04	USA	BEL	0.16	ITA	IDN
Botswana	566	13.48	158	0.02	ZWE	AUS	0.24	JPN	GAB
Brazil	2248	33.06	132	0.01	USA	ARM	0.26	IRL	ESP
Brunei Darussalam	661	21.32	169	0.03	CHN	ISR	0.32	NZL	TLS
Bulgaria	3214	46.58	131	0.01	MKD	CHL	0.27	EST	NGA
Burkina Faso	446	13.94	168	0.03	CIV	CMR	0.27	GIN	FRA
Burundi	1290	36.86	165	0.03	TZA	CHN	0.23	AGO	ITA
Cabo Verde	107	8.23	187	0.07	AGO	BFA	0.33	MAC	GNB
Cambodia	1957	72.48	173	0.04	VNM	BEL	0.23	FIN	CHE
Cameroon	179	8.14	178	0.04	NGA	KEN	0.26	BFA	RWA
Canada	4625	37.60	77	0.01	USA	AZE	0.25	NER	ALB
Central African Republic	227	8.73	174	0.03	COD	ARE	0.34	USA	LBY
Chad	503	16.23	169	0.03	LBY	AZE	0.32	GBR	TUN
Chile	1702	30.39	144	0.02	GBR	ALB	0.25	CRI	HTI
China	19657	116.31	31	0.01	USA	BDI	0.30	SWZ	BFA
Colombia	3276	52.84	138	0.02	USA	AFG	0.19	DNK	SAU
Comoros	120	8.00	185	0.06	MDG	DZA	0.31	MUS	FRA
Congo	794	21.46	163	0.03	COD	ARE	0.30	GBR	UKR
Costa Rica	517	17.83	171	0.03	NIC	JAM	0.29	BLZ	ITA

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Cote d'Ivoire	900	26.47	166	0.03	FRA	DJI	0.23	BEL	IRN
Croatia	2843	47.38	140	0.02	USA	CUB	0.25	NGA	IRN
Cuba	5936	53.00	88	0.01	USA	BGD	0.29	UGA	CZE
Cyprus	2475	44.20	144	0.02	TUR	AGO	0.25	MEX	KWT
Czech Republic	4531	55.94	119	0.01	AUT	ARM	0.25	YEM	KEN
Democratic Rep. of the Congo	2643	45.57	142	0.02	UGA	AUS	0.21	PRK	LBR
Denmark	1611	22.38	128	0.01	USA	ARG	0.29	ERI	RWA
Djibouti	1101	29.76	163	0.03	SOM	BGR	0.32	GBR	SAU
Dominica	73	4.87	185	0.06	USA	BWA	0.28	CAN	TTO
Dominican Republic	405	12.27	167	0.03	HTI	ECU	0.26	ECU	FRA
Ecuador	631	25.24	175	0.04	COL	BHR	0.28	DOM	LBN
Egypt	13575	124.54	91	0.01	ISR	GIN	0.28	MDG	CYP
El Salvador	438	15.64	172	0.03	USA	FRA	0.19	BLZ	ITA
Equatorial Guinea	57	4.75	188	0.05	AGO	DZA	0.37	COD	NGA
Eritrea	3016	67.02	155	0.02	ETH	BEN	0.23	IRL	RUS
Estonia	1603	34.11	153	0.02	RUS	GEO	0.29	IRQ	SYR
Ethiopia	3898	54.90	129	0.01	ERI	COG	0.27	BEL	AUT
Fiji	821	22.19	163	0.03	AUS	IRL	0.23	SGP	IDN
Finland	1603	23.57	132	0.01	RUS	BRA	0.29	LBN	MDV
France	15728	97.69	39	0.01	RUS	ATG	0.22	GNB	MUS
Gabon	215	7.68	172	0.03	FRA	BEN	0.24	TUR	NGA
Gambia	464	13.26	165	0.03	SEN	BEL	0.24	TUN	FSM
Georgia	458	22.90	180	0.05	RUS	LTU	0.33	EST	CHE
Germany	12037	93.31	71	0.01	RUS	BHS	0.24	UZB	BHS
Ghana	716	13.77	148	0.02	NGA	AGO	0.26	DNK	THA
Greece	5315	77.03	131	0.01	TUR	ARG	0.18	LUX	JOR
Grenada	121	7.56	184	0.04	USA	COL	0.26	IDN	MWI

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Guatemala	800	33.33	176	0.04	BLZ	PRT	0.19	VEN	ECU
Guinea	1046	30.76	166	0.03	LBR	AGO	0.23	BEL	PNG
Guinea-Bissau	404	16.83	176	0.04	SEN	BFA	0.29	FRA	CHN
Guyana	313	15.65	180	0.04	SUR	BLZ	0.17	JAM	HTI
Haiti	637	26.54	176	0.04	USA	BLZ	0.26	BLZ	COL
Honduras	584	29.20	180	0.05	NIC	IRN	0.26	VEN	IRN
Hungary	3030	45.91	134	0.02	SVK	IND	0.27	MEX	IND
Iceland	159	7.95	180	0.05	CHN	SWE	0.34	GBR	USA
India	2988	44.60	133	0.01	PAK	ARM	0.19	SLE	ASM
Indonesia	5219	59.31	112	0.01	TLS	BEL	0.15	JOR	ETH
Iran	15633	143.42	91	0.01	USA	CIV	0.27	MWI	HND
Iraq	10179	124.13	118	0.01	KWT	DNK	0.20	THA	UZB
Ireland	2569	35.68	128	0.01	GBR	BRA	0.23	ERI	NAM
Israel	34214	308.23	89	0.01	PSE	BEN	0.19	NPL	FJI
Italy	7804	63.97	78	0.01	RUS	BHR	0.20	BHR	BDI
Jamaica	170	7.39	177	0.04	CUB	BEN	0.24	BLZ	TTO
Japan	16282	124.29	69	0.01	USA	CIV	0.34	BWA	SLB
Jordan	8911	110.01	119	0.01	ISR	ARM	0.27	SWE	RWA
Kazakhstan	2508	52.25	152	0.02	RUS	KNA	0.28	SAU	LKA
Kenya	3412	42.12	119	0.01	USA	BEN	0.19	POL	TUR
Kiribati	52	5.78	191	0.09	FJI	CHN	0.23	JPN	NZL
Kuwait	3407	54.95	138	0.02	IRQ	CIV	0.27	CYP	PAK
Kyrgyzstan	1792	57.81	169	0.03	RUS	AUT	0.24	MNG	ISR
Laos	1070	41.15	174	0.04	VNM	BLR	0.22	SGP	DNK
Latvia	2391	49.81	152	0.02	RUS	BMU	0.29	JPN	ESP
Lebanon	8920	135.15	134	0.02	ISR	HRV	0.17	GRC	ECU
Lesotho	113	5.65	180	0.04	ZAF	DZA	0.25	MOZ	SYC

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Liberia	1478	36.95	160	0.02	SLE	BEL	0.29	BEL	RWA
Libya	4539	47.28	104	0.01	EGY	AUS	0.29	KEN	NGA
Liechtenstein	64	8.00	192	0.11	DEU	MCO	0.23	CHE	FRA
Lithuania	1954	46.52	158	0.02	RUS	GEO	0.27	JPN	ESP
Luxembourg	347	12.39	172	0.03	BEL	KOR	0.20	VNM	AUT
Macao	169	21.12	192	0.12	CHN	CPV	0.34	PRT	USA
Macedonia	1790	43.66	159	0.02	ALB	BGD	0.28	FRA	SWE
Madagascar	135	6.14	178	0.04	FRA	AUS	0.27	EGY	TUR
Malawi	374	11.33	167	0.03	MOZ	CUB	0.26	COD	DEU
Malaysia	3844	48.05	120	0.01	PHL	COG	0.25	COG	NLD
Maldives	131	3.54	163	0.02	USA	AGO	0.09	AGO	DEU
Mali	698	15.86	156	0.02	SLE	BEL	0.28	IRQ	NLD
Malta	229	9.54	176	0.04	LBY	EST	0.23	LTU	DEU
Marshall Islands	40	5.71	193	0.11	USA	NRU	0.27	USA	COK
Mauritania	487	13.53	164	0.03	SEN	AUT	0.27	GIN	QAT
Mauritius	212	7.31	171	0.03	USA	BEN	0.27	COD	NAM
Mexico	2451	36.58	133	0.01	USA	BGR	0.22	URY	HUN
Micronesia	404	7.21	144	0.02	CHN	ARM	0.28	ITA	LKA
Moldova	1147	40.96	172	0.04	RUS	KGZ	0.27	ESP	GRC
Monaco	242	8.96	173	0.03	USA	CZE	0.20	ZAF	KEN
Mongolia	710	20.88	166	0.03	RUS	CAN	0.34	KGZ	THA
Morocco	2177	27.56	121	0.01	ESP	KEN	0.27	KEN	PRT
Mozambique	1435	22.08	135	0.01	ZAF	ARE	0.31	AUT	MDG
Myanmar	1594	45.54	165	0.03	THA	COL	0.21	SGP	PRK
Namibia	2145	36.36	141	0.02	AGO	BEL	0.24	ESP	ITA
Nepal	795	21.49	163	0.03	BTN	AGO	0.26	PHL	KOR
Netherlands	2360	23.60	100	0.01	HRV	IND	0.21	ROU	DZA

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
New Zealand	1524	26.74	143	0.02	FJI	ARG	0.29	LAO	ARG
Nicaragua	725	23.39	169	0.03	HND	DNK	0.28	BLZ	PER
Niger	369	12.30	170	0.03	NGA	COG	0.28	SDN	CMR
Nigeria	4645	43.01	92	0.01	USA	HRV	0.25	HRV	YEM
North Korea	11166	136.17	118	0.01	KOR	HUN	0.30	HUN	IRQ
Norway	2508	31.35	120	0.01	RUS	BHR	0.32	TZA	AUS
Oman	1000	23.26	157	0.02	ISR	AGO	0.30	KOR	MAR
Pakistan	6469	75.22	114	0.01	AFG	AUT	0.18	CZE	ESP
Palau	52	4.73	189	0.08	JPN	COK	0.29	KIR	PHL
Palestine	18513	240.43	123	0.01	ISR	CHL	0.25	MOZ	AFG
Panama	1047	33.77	169	0.03	USA	CHL	0.20	FRA	CHE
Papua New Guinea	279	12.68	178	0.04	AUS	FRA	0.22	GBR	GIN
Paraguay	410	24.12	183	0.05	BRA	ITA	0.22	MEX	ISR
Peru	1811	32.34	144	0.02	USA	BEL	0.19	ABW	TTO
Philippines	4073	64.65	137	0.02	USA	BEL	0.20	BGD	ETH
Poland	4471	53.23	116	0.01	RUS	AGO	0.29	COL	PER
Portugal	2467	29.37	116	0.01	AGO	BOL	0.26	LBN	PAK
Qatar	2213	43.39	149	0.02	ISR	AUS	0.28	SOM	NLD
Romania	149	8.76	183	0.05	CZE	BGR	0.31	ALB	CZE
Russian Federation	40414	308.50	69	0.01	USA	CIV	0.22	MOZ	MDV
Rwanda	2891	56.69	149	0.02	UGA	AUS	0.15	UKR	CHL
Saint Helena, Ascension and Tristan da Cunha	61	10.17	194	0.15	MMR	PER	0.29	THA	MMR
Saint Kitts and Nevis	147	8.65	183	0.05	GBR	IRQ	0.24	DEU	USA
Sao Tome and Principe	155	9.69	184	0.05	AGO	COD	0.42	ESP	NGA
Saudi Arabia	7844	88.13	111	0.01	ISR	EST	0.23	MOZ	NGA
Senegal	1068	18.41	142	0.02	GNB	COG	0.16	ZMB	TCD

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Seychelles	148	6.43	177	0.04	AUS	COL	0.27	TZA	LSO
Sierra Leone	2130	36.72	142	0.02	GBR	AUS	0.23	UKR	ESP
Singapore	1802	30.03	140	0.02	IDN	ARM	0.24	BHR	IRQ
Slovakia	2728	47.86	143	0.02	CZE	LBY	0.30	MYS	LKA
Solomon Islands	394	30.31	187	0.07	AUS	NGA	0.14	VUT	JPN
Somalia	1612	41.33	161	0.03	DJI	BDI	0.10	AUS	TZA
South Africa	3597	39.53	109	0.01	ZWE	BEN	0.24	MDV	MCO
South Korea	9634	117.49	118	0.01	PRK	DMA	0.34	AGO	ISR
Spain	5331	52.78	99	0.01	GBR	ARE	0.19	NAM	GNQ
Sri Lanka	990	22.00	155	0.02	NOR	BRA	0.26	KOR	MYS
Sudan	4296	60.51	129	0.01	EGY	CZE	0.24	MYS	CZE
Suriname	120	13.33	191	0.10	GUY	PER	0.30	PRK	FRA
Swaziland	202	8.78	177	0.04	ZAF	BEN	0.25	MUS	GBR
Sweden	1876	25.35	126	0.01	RUS	CYP	0.26	TZA	JOR
Switzerland	8014	67.92	82	0.01	RUS	BHS	0.23	MOZ	RWA
Syrian Arab Republic	10406	185.82	144	0.02	ISR	AZE	0.26	KOR	EST
Tajikistan	2498	73.47	166	0.03	RUS	IRL	0.29	ARM	AFG
Tanzania	1985	35.45	144	0.02	BDI	BWA	0.25	SLE	AFG
Thailand	3722	51.69	128	0.01	MMR	BEL	0.10	BEL	LBN
Timor-Leste	1469	39.70	163	0.03	IDN	FIN	0.17	SLE	BGD
Togo	688	14.33	152	0.02	CIV	BWA	0.22	RUS	IRN
Tonga	31	6.20	195	0.15	CHN	GRC	0.17	AUS	NZL
Trinidad and Tobago	125	6.58	181	0.04	USA	DMA	0.27	GRD	PER
Tunisia	1539	27.48	144	0.02	PSE	AUT	0.27	GMB	DEU
Turkey	11875	118.75	100	0.01	GRC	CHL	0.22	GAB	MDV
Turkmenistan	1307	50.27	174	0.04	RUS	ARE	0.30	DEU	IRQ
Uganda	5113	69.09	126	0.01	RWA	GAB	0.27	CUB	KWT

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Table A.3: Descriptive statistics for political data based on GDELT

Country	Number of events	Mean number of events by country	Number of countries w/o events	Mean importance	Max. importance country	Min. importance country	Mean. mood	Max. mood country	Min. mood country
Ukraine	5266	73.14	128	0.01	RUS	AUS	0.31	LKA	AFG
United Arab Emirates	1496	24.52	139	0.02	IRQ	ARM	0.23	UGA	LKA
United Kingdom	18842	118.50	41	0.01	USA	DJI	0.20	COG	DOM
United States	56651	316.49	21	0.01	ISR	BIH	0.20	NRU	LSO
Uruguay	346	15.73	178	0.04	ARG	CAN	0.33	GBR	ESP
Uzbekistan	2147	63.15	166	0.03	TJK	IRQ	0.27	DEU	IRQ
Vanuatu	47	4.70	190	0.07	SLB	MAR	0.19	SLB	FRA
Vatican	1108	20.15	145	0.02	ITA	BEL	0.26	TUR	RWA
Venezuela	2078	35.22	141	0.02	COL	GRD	0.27	JAM	PRK
Viet Nam	4283	58.67	127	0.01	USA	AGO	0.30	ARG	FIN
Yemen	2535	46.09	145	0.02	SAU	AUT	0.22	CZE	NGA
Zambia	2269	39.81	143	0.02	AGO	BGD	0.27	DEU	SEN
Zimbabwe	2886	44.40	135	0.02	GBR	BRA	0.26	JPN	NOR

	<i>Dependent variable:</i>	
	agree2un (1)	agree3un (2)
Mean (Importance _{odt} , Importance _{odt})	0.088*** (0.014)	0.276*** (0.013)
Mood _{odt} /2 + 0.5 ∈ [0, 1]	1.361*** (0.001)	1.274*** (0.001)
Observations	165,106	165,152
R ²	0.936	0.940
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

Table A.4: Comparison of Mood and Importance with Voeten and Merdzanovic (2009)'s UNGA voting similarity index

A.5 Additional Estimation Results

	<i>First stage regressions:</i>	
	Importance _{odt}	Importance _{odt} × Trade gains _{odt} ^{NR}
Importance _{odt} ^{Instr}	1.358*** (0.058)	-3.259* (1.602)
Mood _{odt}	-0.009*** (0.001)	0.033 (0.029)
Trade gains _{odt} ^{NR}	0.003*** (0.001)	0.109*** (0.017)
Importance _{odt} ^{Instr} × Trade gains _{odt} ^{NR}	-0.012*** (0.002)	0.723*** (0.109)
Mood _{odt} × Trade gains _{odt} ^{NR}	-0.003** (0.001)	-0.093* (0.041)
Country × Year FE	yes	yes
Observations	39,840	39,840
R ²	0.516	0.751
Adjusted R ²	0.459	0.722
Partial R ²	0.12	0.04
F-Statistic on Instrument	32.15	15.33

Notes: Robust standard errors in parentheses are clustered by country × year. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table A.5: First Stage Regressions for IV Estimations: Decision

	Dependent variable:					
	$Pr(\mathbf{d}_{od,t+1} > 0 \mid \mathbf{d}_{od,t} = 0)$					
	(1)	(2)	(3)	(4)	(5)	(6)
Importance _{odt}	0.010** (0.005)	0.346** (0.154)	0.146 (0.155)	0.345** (0.174)		0.764** (0.344)
Importance _{dot}	0.069 (0.049)	0.007 (0.052)	-0.005 (0.074)	-0.054 (0.050)		0.147 (0.145)
Mood _{odt}	0.007 (0.131)	0.010 (0.007)	-0.001 (0.008)	-0.005 (0.013)		0.007 (0.007)
Trade gains _{odt} ^{NR}	0.024*** (0.005)	0.032*** (0.010)	0.076*** (0.011)	0.007 (0.005)	0.024*** (0.005)	0.022*** (0.008)
Trade gains _{dot} ^{NR}	0.001*** (0.0002)	0.001** (0.0003)	0.001** (0.0005)	-0.0002 (0.0004)	0.001*** (0.0002)	0.001** (0.0003)
Importance _{odt} × Trade gains _{odt} ^{NR}		-0.118 (0.099)	-0.355*** (0.094)	-0.165** (0.079)		-0.318*** (0.084)
Importance _{dot} × Trade gains _{dot} ^{NR}		-0.0001 (0.001)	0.007 (0.005)	0.002 (0.002)		-0.004* (0.002)
Mood _{odt} × Trade gains _{odt} ^{NR}		0.051** (0.025)	0.022 (0.023)	0.033** (0.020)		0.043** (0.019)
Mood _{dot} × Trade gains _{dot} ^{NR}		0.001* (0.001)	0.002 (0.001)	0.0001 (0.001)		0.00000 (0.00005)
UNGA Vote similarity					0.064* (0.034)	
Shared border		-0.008 (0.011)				
Shared language		0.011 (0.010)				
Colonial history		-0.024* (0.014)				
Conflict		-0.029*** (0.008)				
log(Distance)		-0.017*** (0.005)				
Country × Year FE	yes	yes	yes	yes	yes	yes
Note	-	Controls	Country-pair FE	10yr lag	UNGA	IV
Observations	24,012	24,012	24,012	11,168	22,819	24,012
R ²	0.577	0.122	0.704	0.636	0.581	0.574
Adjusted R ²	0.498	0.110	0.527	0.527	0.502	0.495

Notes: Robust standard errors in parentheses are clustered by country × year. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table A.6: Probability of forming EIA

	Dependent variable:					
	$d_{od,t+1} - d_{od,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Importance _{odt}	0.007** (0.003)	0.324*** (0.081)	0.072 (0.098)	0.484*** (0.095)		0.353** (0.179)
Importance _{dot}	0.028 (0.023)	-0.007 (0.027)	0.012 (0.052)	-0.007 (0.026)		0.004 (0.087)
Mood _{odt}	-0.006 (0.060)	0.029*** (0.006)	0.007 (0.005)	0.028*** (0.007)		0.005 (0.004)
Trade gains _{odt} ^{NR}	0.015*** (0.004)	0.017*** (0.006)	0.062*** (0.009)	0.007* (0.004)	0.015*** (0.003)	0.019*** (0.006)
Trade gains _{dot} ^{NR}	0.0003** (0.0001)	0.0002 (0.0002)	0.001*** (0.0003)	0.0005* (0.0002)	0.0004*** (0.0001)	0.0004*** (0.0002)
Importance _{odt} × Trade gains _{odt} ^{NR}		-0.054 (0.062)	-0.271*** (0.070)	-0.071 (0.053)		-0.182*** (0.057)
Importance _{dot} × Trade gains _{dot} ^{NR}		0.00001 (0.001)	0.005 (0.004)	-0.001 (0.001)		-0.001 (0.002)
Mood _{odt} × Trade gains _{odt} ^{NR}		0.013 (0.016)	-0.009 (0.016)	0.019 (0.014)		0.011 (0.012)
Mood _{dot} × Trade gains _{dot} ^{NR}		-0.001* (0.0004)	0.0002 (0.0004)	-0.002*** (0.001)		0.0001 (0.0003)
UNGA Vote similarity					0.039* (0.023)	
Shared border		0.012** (0.006)				
Shared language		0.0002 (0.003)				
Colonial history		0.004 (0.006)				
Conflict		-0.012*** (0.005)				
log(Distance)		0.0004 (0.0002)				
Country × Year FE	yes	yes	yes	yes	yes	yes
Note	-	Controls	Country-pair FE	10yr lag	UNGA	IV
Observations	23,996	23,996	23,996	11,164	22,803	23,996
R ²	0.585	0.019	0.686	0.013	0.599	0.584
Adjusted R ²	0.508	0.019	0.499	0.012	0.523	0.507

Notes: Robust standard errors in parentheses are clustered by country × year. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table A.7: Change of Depth

<i>First stage regressions:</i>				
	Importance _{odt}	Importance _{dot}	Importance _{odt} × Trade gains _{odt} ^{NR}	Importance _{dot} × Trade gains _{dot} ^{NR}
Importance _{odt} ^{Instr}	1.3787*** (0.0848)	0.3491** (0.111)	-0.2977* (0.1418)	-0.266 (1.9591)
Importance _{dot} ^{Instr}	0.0134 (0.0199)	1.1795*** (0.1112)	-0.08** (0.0281)	-1.2842 (2.6018)
Mood _{odt}	-0.0029*** (0.0008)	-0.0069** (0.002)	-0.0031* (0.0018)	0.124 (0.0818)
Trade gains _{odt} ^{NR}	0.0071*** (0.001)	0.0138*** (0.002)	0.0201*** (0.0040)	0.0089 (0.0205)
Trade gains _{dot} ^{NR}	0.0002*** (0.001)	0.0015*** (0.0003)	-0.0001 (0.0000)	0.0730*** (0.0192)
Importance _{odt} ^{Instr} × Trade gains _{odt} ^{NR}	0.1084** (0.0342)	-0.0694* (0.0405)	2.1662*** (0.2346)	0.1373 (0.4663)
Importance _{dot} ^{Instr} × Trade gains _{dot} ^{NR}	-0.0013*** (0.0003)	-0.0039* (0.0024)	0.0005 (0.0004)	0.8472*** (0.1799)
Mood _{odt} × Trade gains _{odt} ^{NR}	-0.0102*** (0.0028)	-0.0175** (0.006)	- 0.0081 (0.0112)	0.0005 (0.0565)
Mood _{dot} × Trade gains _{dot} ^{NR}	-0.0001 (0.0001)	-0.0011* (0.0007)	0.0000 (0.0001)	-0.0699** (0.0352)
Country × Year FE	yes	yes	yes	yes
Observations	23,996	23,996	23,996	23,996
R ²	0.603	0.598	0.769	0.77
Adjusted R ²	0.5293	0.523	0.726	0.727
Partial R ²	0.13	0.087	0.146	0.06
F-Statistic on Instrument	14.93	10.23	14.24	13.31

Notes: Robust standard errors in parentheses are clustered by country × year. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table A.8: First Stage Regressions for IV Estimations: Heterogeneity

Appendix B

Impact of Sanctions on Sanctioning Country Exports

B.1 Country-level Data

Table B.1: Descriptive statistics for exports to Russia in 2012

Country	Sanctions	Mean exports	Share of embargoed ex-ports	Share exports to Russia	Share of embargoed ex-ports to Russia
Argentina	FALSE	85936844.44	0.08	0.01	0.47
Australia	TRUE	205707651.90	0.06	0.00	0.43
Austria	TRUE	220764492.46	0.03	0.04	0.02
Belgium	TRUE	617637152.89	0.04	0.02	0.05
Bulgaria	TRUE	31939457.69	0.02	0.03	0.02
Belarus	FALSE	64413678.69	0.08	0.37	0.20
Brazil	FALSE	234022075.64	0.06	0.02	0.51
Canada	TRUE	623423426.84	0.03	0.00	0.34
Switzerland	FALSE	304466773.18	0.01	0.02	0.03
Chile	FALSE	80309298.54	0.16	0.01	0.74
Cyprus	TRUE	1812282.86	0.17	0.02	0.53
Czech Republic	TRUE	230067416.74	0.01	0.04	0.00
Germany	TRUE	1797757171.46	0.02	0.04	0.02
Denmark	TRUE	134782890.19	0.12	0.02	0.19
Algeria	FALSE	181442939.77	0.00	0.00	0.97
Egypt	FALSE	27333880.56	0.05	0.01	0.76
Spain	TRUE	362108402.99	0.09	0.02	0.16
Estonia	TRUE	21400343.19	0.03	0.14	0.04
Finland	TRUE	90274628.90	0.01	0.12	0.05
France	TRUE	719828711.96	0.04	0.02	0.03
United Kingdom	TRUE	562873529.56	0.02	0.02	0.01
Greece	TRUE	35408947.64	0.10	0.02	0.29
Hong Kong	FALSE	267318172.27	0.00	0.01	0.01
Hungary	TRUE	134769157.04	0.02	0.04	0.02
India	FALSE	265377176.61	0.03	0.01	0.03
Ireland	TRUE	167607783.06	0.06	0.01	0.13
Israel	FALSE	84691965.41	0.02	0.02	0.23
Italy	TRUE	653521902.30	0.03	0.03	0.02
Japan	TRUE	783779172.96	0.00	0.02	0.00
Lithuania	TRUE	42252718.62	0.08	0.21	0.21

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Table B.1: Descriptive statistics for exports to Russia in 2012

Country	Sanctions	Mean exports	Share of embargoed ex-ports	Share exports to Russia	Share of embargoed ex-ports to Russia
Luxembourg	TRUE	27667347.86	0.03	0.01	0.02
Latvia	TRUE	17212301.84	0.05	0.13	0.03
Mexico	FALSE	530570389.84	0.03	0.00	0.23
Malta	TRUE	4515775.09	0.04	0.02	0.00
Malaysia	FALSE	264526826.04	0.01	0.00	0.01
Netherlands	TRUE	728404996.38	0.05	0.02	0.05
Norway	TRUE	237596744.02	0.05	0.01	0.70
New Zealand	TRUE	38658455.77	0.33	0.01	0.72
Peru	FALSE	54107656.23	0.06	0.00	0.66
Philippines	FALSE	66173955.01	0.03	0.00	0.19
Poland	TRUE	264345582.72	0.05	0.06	0.09
Portugal	TRUE	73857553.20	0.04	0.00	0.03
Romania	TRUE	76829394.34	0.01	0.03	0.00
Russian Federation	FALSE	1137025212.19	0.00		
Singapore	FALSE	541328587.51	0.01	0.00	0.01
Slovakia	TRUE	119105277.97	0.01	0.04	0.00
Slovenia	TRUE	34178206.68	0.01	0.05	0.02
Sweden	TRUE	227719042.18	0.03	0.02	0.00
Thailand	FALSE	250066747.56	0.03	0.01	0.04
Turkey	FALSE	140334455.76	0.05	0.07	0.14
Ukraine	TRUE	78363287.03	0.02	0.35	0.04
United States	TRUE	1719068879.73	0.03	0.01	0.12
South Africa	FALSE	74507956.47	0.05	0.01	0.31
Indonesia	FALSE	214679843.24	0.02	0.01	0.08

B.2 EU Sanctions: List of Restricted Products

Table B.2: HS codes affected by export restrictions to Russia imposed by the European Union

Commodity Code	List of products
7304 11 00	Line pipe of a kind used for oil or gas pipelines, seamless, of stainless steel
7304 19 10	Line pipe of a kind used for oil or gas pipelines, seamless, of iron or steel, of an external diameter not exceeding 168,3 mm (excl. products of stainless steel or of cast iron)
7304 19 30	Line pipe of a kind used for oil or gas pipelines, seamless, of iron or steel, of an external diameter exceeding 168,3 mm but not exceeding 406,4 mm (excl. products of stainless steel or of cast iron)
7304 19 90	Line pipe of a kind used for oil or gas pipelines, seamless, of iron or steel, of an external diameter exceeding 406,4 mm (excl. products of stainless steel or of cast iron)
7304 22 00	Drill pipe, seamless, of stainless steel, of a kind used in drilling for oil or gas
7304 23 00	Drill pipe, seamless, of a kind used in drilling for oil or gas, of iron or steel (excl. products of stain less steel or of cast iron)
7304 29 10	Casing and tubing of a kind used for drilling for oil or gas, seamless, of iron or steel, of an external diameter not exceeding 168,3 mm (excl. products of cast iron)
7304 29 30	Casing and tubing of a kind used for drilling for oil or gas, seamless, of iron or steel, of an external diameter exceeding 168,3 mm, but not exceeding 406,4 mm (excl. products of cast iron)
7304 29 90	Casing and tubing of a kind used for drilling for oil or gas, seamless, of iron or steel, of an external diameter exceeding 406,4 mm (excl. products of cast iron)
7305 11 00	Line pipe of a kind used for oil or gas pipelines, having circular cross-sections and an external diameter of exceeding 406,4 mm, of iron or steel, longitudinally submerged arc welded
7305 12 00	Line pipe of a kind used for oil or gas pipelines, having circular cross-sections and an external diameter of exceeding 406,4 mm, of iron or steel, longitudinally arc welded (excl. products longitudinally submerged arc welded)

Table B.2 – *Continued on next page*

Table B.2 – Continued from previous page

7305 19 00	Line pipe of a kind used for oil or gas pipelines, having circular cross-sections and an external diameter of exceeding 406,4 mm, of flat-rolled products of iron or steel (excl. products longitudinally arc welded)
7305 20 00	Casing of a kind used in drilling for oil or gas, having circular cross-sections and an external diameter of exceeding 406,4 mm, of flat-rolled products of iron or steel
7306 11	Line pipe of a kind used for oil or gas pipelines, welded, of flat-rolled products of stainless steel, of an external diameter of not exceeding 406,4 mm
7306 19	Line pipe of a kind used for oil or gas pipelines, welded, of flat-rolled products of iron or steel, of an external diameter of not exceeding 406,4 mm (excl. products of stainless steel or of cast iron)
7306 21 00	Casing and tubing of a kind used in drilling for oil or gas, welded, of flat-rolled products of stainless steel, of an external diameter of not exceeding 406,4 mm
7306 29 00	Casing and tubing of a kind used in drilling for oil or gas, welded, of flat-rolled products of iron or steel, of an external diameter of not exceeding 406,4 mm (excl. products of stainless steel or of cast iron)
8207 13 00	Rock-drilling or earth-boring tools, interchangeable, with working parts of sintered metal carbides or cermets
8207 19 10	Rock-drilling or earth-boring tools, interchangeable, with working parts of diamond or agglomerated diamond
8413 50	Reciprocating positive displacement pumps for liquids, power-driven (excl. those of subheading 8413 11 and 8413 19, fuel, lubricating or cooling medium pumps for internal combustion piston engine and concrete pumps)
8413 60	Rotary positive displacement pumps for liquids, power-driven (excl. those of subheading 8413 11 and 8413 19 and fuel, lubricating or cooling medium pumps for internal combustion piston engine)
8413 82 00	Liquid elevators (excl. pumps)
8413 92 00	Parts of liquid elevators, n.e.s.
8430 49 00	Boring or sinking machinery for boring earth or extracting minerals or ores, not self-propelled and not hydraulic (excl. tunnelling machinery and hand-operated tools)
ex 8431 39 00	Parts of machinery of heading 8428, n.e.s.
ex 8431 43 00	parts for boring or sinking machinery of subheading 8430 41 or 8430 49, n.e.s.

Table B.2 – Continued on next page

Table B.2 – *Continued from previous page*

ex 8431 49	Parts of machinery of heading 8426, 8429 and 8430, n.e.s.
8705 20 00	Mobile drilling derricks
8905 20 00	Floating or submersible drilling or production platforms
8905 90 10	Sea-going light vessels, fire-floats, floating cranes and other vessels, the navigability of which is subsidiary to their main function (excl. dredgers, floating or submersible drilling or production platforms; fishing vessels and warships)

B.3 Russian Sanctions: List of Embargoed Products

Table B.3: HS codes banned by the Russian Federation

Code	Simplified description	Code	Simplified description
0201	Meat of bovine animals, fresh or chilled	0202	Meat of bovine animals, frozen
0203	Meat of swine, fresh, chilled or frozen	0207	Meat and edible offal, fresh, chilled or frozen
0210*	Meat and edible offal, salted, in brine, dried or smoked	0301*	Live fish
0302	Fish, fresh or chilled	0303	Fish, frozen
0304	Fish fillets and other fish meat, etc	0305	Fish, dried, salted, smoked or in brine
0306	Crustaceans, etc.	0307	Molluscs, etc.
0308	Other aquatic invertebrates	0401*	Milk and cream
0402*	Milk and cream, concentrated or containing sweetening matter	0403*	Buttermilk, yogurt and other fermented milk and cream
0404*	Whey ; products consisting of natural milk constituents	0405*	Butter and fats derived from milk; dairy spreads
0406*	Cheese and curd	0701*	Potatoes, fresh or chilled
0702	Tomatoes, fresh or chilled	0703*	Onions, leeks and other alliaceous vegetables, fresh or chilled
0704	Cabbages and similar edible brassicas, fresh or chilled	0705	Lettuce and chicory , fresh or chilled
0706	Carrots and similar edible roots, fresh or chilled	0707	Cucumbers and gherkins, fresh or chilled
0708	Leguminous vegetables, fresh or chilled	0709	Other vegetables, fresh or chilled
0710	Vegetables, frozen	0711	Vegetables provisionally preserved
0712*	Dried vegetables, whole, cut, sliced, broken or in powder	0713*	Dried leguminous vegetables, shelled
0714	Manioc, arrowroot and similar roots	0801	Coconuts, Brazilsl nuts and cashew nuts
0802	Other nuts, fresh or dried	0803	Bananas, including plantains, fresh or dried
0804	Dates, figs, pineapples, avocados, guavas, mangoes	0805	Citrus fruit, fresh or dried

Table B.3 – Continued on next page

Table B.3 – *Continued from previous page*

0806	Grapes, fresh or dried	0807	Melons (including watermelons) and papaws (papayas), fresh
0808	Apples, pears and quinces, fresh	0809	Apricots, cherries, peaches, plums and sloes, fresh
0810	Other fruit, fresh	0811	Fruit and nuts, frozen
0813	Fruit and nuts, provisionally preserved	1601	Sausages and similar products, of meat, meat offal or blood
1901*	Malt extract; food preparations of flour, groats, meal, starch or malt extract, etc.	2106*	Food preparations not elsewhere specified or included

B.4 Quantification of Lost Trade

Country	Observed value	PE predicted value	MI predicted value	GE predicted value	Partial impact	Modular impact	GE impact
Australia	20.88	30.52	25.72	29.49	-9.64	-4.84	-8.62
Belgium	451.52	562.03	495.61	538.23	-110.52	-44.09	-86.71
Bulgaria	58.02	68.26	59.90	65.61	-10.23	-1.88	-7.58
Canada	88.04	104.29	91.24	100.33	-16.25	-3.20	-12.29
Cyprus	1.66	2.90	2.58	2.75	-1.24	-0.92	-1.09
Czech Republic	450.90	514.82	455.32	494.39	-63.92	-4.42	-43.49
Germany	3215.04	3961.75	3489.10	3799.32	-746.70	-274.06	-584.28
Denmark	118.62	144.20	126.78	138.14	-25.58	-8.16	-19.52
Spain	280.69	342.47	302.51	329.34	-61.78	-21.82	-48.65
Estonia	207.11	165.95	151.09	161.03	41.16	56.01	46.08
Finland	504.59	613.25	534.68	586.46	-108.66	-30.09	-81.87
France	653.24	719.42	635.14	690.00	-66.18	18.10	-36.76
United Kingdom	534.08	714.54	625.75	684.29	-180.46	-91.66	-150.20
Georgia	22.91	8.47	8.39	8.23	14.44	14.52	14.68
Greece	39.50	49.78	44.21	47.78	-10.28	-4.72	-8.29
Hungary	233.26	299.49	263.22	287.24	-66.23	-29.96	-53.98
Ireland	79.56	65.41	57.50	62.77	14.15	22.06	16.79
Italy	1047.15	1078.10	954.88	1038.38	-30.95	92.27	8.77
Japan	774.73	891.03	782.81	856.12	-116.29	-8.08	-81.38
Lithuania	562.27	594.66	518.47	568.96	-32.39	43.80	-6.69
Luxembourg	13.08	16.95	14.91	16.32	-3.87	-1.83	-3.24
Latvia	121.20	145.50	127.80	139.17	-24.30	-6.60	-17.97
Malta	0.37	1.67	1.41	1.57	-1.30	-1.04	-1.21
Netherlands	709.00	878.94	774.18	844.39	-169.94	-65.18	-135.39
Norway	71.18	107.13	94.13	102.57	-35.96	-22.95	-31.39
Poland	782.77	952.67	832.91	913.70	-169.90	-50.14	-130.93
Romania	159.25	145.80	129.60	140.12	13.45	29.65	19.13
Slovakia	230.70	276.09	242.75	264.79	-45.39	-12.06	-34.09
Slovenia	111.92	103.28	92.31	99.26	8.65	19.61	12.66
Sweden	261.62	275.85	241.65	264.68	-14.23	19.96	-3.06
United States	896.79	878.33	776.86	842.37	18.46	119.93	54.42

Note: Average lost trade to Russia per month in 2014 in millions of USD. PE = Partial equilibrium; MI = Modular impact; GE = General equilibrium.

Table B.4: Average lost trade to Russia per month in 2014 by counterfactual step.

Country	Total		Conflict		Smart sanctions		Economic sanctions	
	absolute	relative	absolute	relative	absolute	relative	absolute	relative
Australia	-14.52	-43.49	7.04	24.04	-16.38	-41.12	-19.55	-61.92
Austria	-24.88	-6.42	15.12	3.79	-60.34	-11.97	-16.03	-4.82
Belgium	-129.21	-25.26	-67.66	-13.39	-182.31	-27.92	-121.87	-27.14
Bulgaria	-12.03	-19.45	-4.90	-8.99	-18.82	-24.21	-10.88	-19.22
Canada	-34.72	-31.58	2.53	2.44	-7.37	-5.58	-57.31	-56.42
Cyprus	-0.28	-15.19	-1.72	-43.48	-0.10	-4.29	0.04	3.90
Czech Republic	-75.56	-16.04	-49.27	-9.73	-100.46	-17.10	-71.41	-17.48
Germany	-832.20	-23.36	-573.93	-15.63	-1044.71	-22.96	-806.04	-26.15
Denmark	-40.16	-28.30	-18.95	-13.54	-32.05	-19.05	-49.63	-38.05
Spain	-74.61	-24.01	-55.72	-17.33	-59.27	-15.61	-86.74	-31.37
Estonia	9.60	5.96	58.56	46.23	9.61	4.66	-3.76	-2.51
Finland	-107.38	-19.72	-43.78	-8.07	-104.98	-16.09	-125.82	-25.35
France	-176.94	-22.22	-76.99	-9.13	-308.79	-28.80	-144.28	-21.91
United Kingdom	-122.72	-20.54	-22.45	-3.84	-174.30	-22.66	-126.63	-24.22
Georgia	14.06	257.04	21.27	769.61	15.78	206.64	11.31	216.56
Greece	-14.03	-29.96	-12.30	-28.68	-13.69	-22.56	-14.65	-35.22
Hungary	-102.41	-33.27	-72.55	-22.40	-146.20	-38.37	-90.65	-33.56
Ireland	0.56	0.89	-0.93	-1.43	34.52	46.63	-14.47	-25.09
Italy	-79.53	-8.06	26.12	2.62	-174.81	-13.12	-65.03	-7.86
Japan	-166.91	-19.92	-111.57	-11.89	-199.53	-18.80	-167.17	-23.57
Lithuania	-113.47	-19.35	-16.86	-3.27	-139.39	-18.59	-128.03	-24.10
Luxembourg	-5.96	-34.02	-9.63	-39.19	-7.29	-34.38	-4.35	-31.28
Latvia	-25.88	-19.49	1.42	1.20	-40.57	-26.30	-26.65	-21.01
Malta	-0.13	-28.26	-0.26	-65.31	-0.29	-57.97	-0.01	-3.29
Montenegro	0.07	23.09	0.35	123.37	0.11	30.58	-0.02	-6.83
Netherlands	-194.16	-24.26	-186.79	-22.08	-234.92	-23.56	-177.64	-25.42
Norway	-56.77	-49.64	8.63	8.25	-10.53	-9.47	-95.63	-80.70
New Zealand	-4.28	-25.15	-2.81	-14.22	1.81	10.98	-6.89	-41.85
Poland	-202.57	-22.87	-75.13	-8.85	-304.29	-26.74	-191.10	-24.45
Portugal	-0.93	-4.53	1.51	7.05	-2.03	-7.34	-0.87	-5.10
Romania	6.82	5.00	20.46	15.48	2.10	1.19	5.24	4.39
Slovakia	-76.58	-27.40	-93.54	-28.81	-78.08	-22.48	-71.28	-30.15
Slovenia	0.44	0.45	1.71	1.69	-9.07	-7.13	4.42	5.22
Sweden	-35.52	-13.78	36.34	16.86	-72.24	-20.78	-38.42	-16.82
Ukraine	-449.90	-36.89	-789.31	-45.99	-118.67	-10.54	-541.03	-50.39
United States	-23.77	-3.69	58.59	9.23	-32.34	-4.01	-42.33	-7.41
average	-85.91	-20.65	-56.47	-12.96	-101.40	-19.25	-86.95	-24.14
cumulative	-3178.68	-20.65	-2089.44	-12.96	-3650.56	-19.25	-3130.04	-24.14

Note: Losses are per month. Absolute losses are in millions of USD. Relative losses are in percent. "Total" is the average monthly loss since December 2013; "Conflict" losses are the average monthly losses incurred during the time of conflict before the imposition of financial sanctions in mid-March 2014; "Smart sanctions" are the monthly losses during the time of conflict and financial sanctions before the imposition of economic sanctions in late July/early August 2014; "Economic sanctions" are average monthly losses incurred since the imposition of trade and banking restrictions.

Table B.5: Losses of total trade by period and country

Country	Total		Conflict		Smart sanctions		Economic sanctions	
	absolute	relative	absolute	relative	absolute	relative	absolute	relative
Australia	-13.02	-68.28	10.29	72.14	-12.96	-65.46	-20.04	-99.52
Austria	-5.33	-49.49	1.83	24.16	-1.05	-10.21	-8.57	-74.25
Belgium	-24.72	-65.74	-5.33	-13.98	-8.02	-24.00	-37.61	-95.47
Bulgaria	-0.85	-54.38	-0.04	-4.45	-0.80	-38.37	-1.12	-73.89
Canada	-12.71	-38.49	13.20	47.72	23.37	85.29	-36.18	-97.67
Cyprus	-0.29	-25.52	-1.07	-41.56	0.16	19.77	-0.25	-96.42
Czech Republic	0.04	4.31	0.75	70.52	1.40	167.42	-0.77	-67.66
Germany	-62.22	-69.10	-33.90	-39.75	-43.15	-54.30	-78.61	-81.76
Denmark	-15.32	-47.18	5.23	17.01	-3.00	-11.19	-26.52	-74.75
Spain	-39.54	-74.17	-16.81	-33.82	-19.11	-38.12	-55.02	-98.73
Estonia	-4.65	-52.86	2.44	40.41	-0.39	-5.38	-8.52	-83.06
Finland	-18.09	-53.80	7.83	28.70	13.67	65.27	-39.59	-96.31
France	-14.19	-50.80	0.18	0.69	-1.40	-5.59	-23.92	-80.99
United Kingdom	-3.33	-44.67	-0.49	-6.11	1.46	23.66	-6.28	-80.01
Georgia	1.57	899.69	3.88	4956.42	0.34	553.14	1.60	670.25
Greece	-8.52	-52.69	-4.39	-34.65	-1.41	-7.48	-15.38	-97.22
Hungary	-5.02	-63.91	1.86	39.63	-3.57	-42.83	-7.56	-88.88
Ireland	-4.02	-36.71	4.02	40.25	0.50	4.80	-8.28	-72.23
Italy	-12.19	-59.63	-0.40	-2.18	-1.43	-8.27	-20.29	-90.45
Japan	0.34	47.98	0.84	142.99	-0.07	-10.41	0.38	50.60
Lithuania	-100.07	-65.20	-47.05	-30.44	-55.72	-34.23	-134.69	-90.43
Luxembourg	-1.48	-74.96	-1.05	-74.15	-1.23	-64.99	-2.00	-83.09
Latvia	-0.22	-4.30	6.24	148.81	4.57	113.55	-4.15	-73.13
Netherlands	-22.19	-38.45	2.64	4.78	7.93	15.49	-42.66	-69.55
Norway	-53.99	-60.07	9.19	10.76	0.13	0.17	-95.83	-97.62
New Zealand	-3.55	-28.09	-1.54	-10.16	1.51	13.85	-5.94	-47.09
Poland	-54.80	-57.40	19.03	24.26	-9.44	-10.22	-95.56	-94.12
Portugal	-0.32	-28.10	0.39	41.52	0.36	41.90	-1.52	-96.29
Romania	-0.16	-52.00	0.03	79.10	-0.22	-42.13	-0.17	-67.63
Slovakia	-0.36	-58.38	-0.02	-2.56	-0.07	-12.32	-0.60	-95.25
Slovenia	-0.37	-17.89	0.37	24.41	-0.10	-5.19	-0.69	-30.08
Sweden	-0.88	-56.15	0.50	48.92	-0.02	-1.59	-1.64	-92.75
Ukraine	-42.98	-58.66	4.81	11.59	-25.99	-39.27	-75.60	-82.25
United States	-42.29	-57.87	-14.42	-24.14	0.27	0.40	-69.23	-87.35
average	-17.29	-57.65	-1.01	-3.79	-3.98	-14.87	-28.49	-87.60
cumulative	-605.03	-57.65	-34.33	-3.79	-135.44	-14.87	-996.99	-87.60

Note: Losses are per month. Absolute losses are in millions of USD. Relative losses are in percent. "Total" is the average monthly loss since December 2013; "Conflict" losses are the average monthly losses incurred during the time of conflict before the imposition of financial sanctions in mid-March 2014; "Smart sanctions" are the monthly losses during the time of conflict and financial sanctions before the imposition of economic sanctions in late July/early August 2014; "Economic sanctions" are average monthly losses incurred since the imposition of trade and banking restrictions.

Table B.6: Losses of embargoed products trade by period and country

Country	Total		Conflict		Smart sanctions		Economic sanctions	
	absolute	relative	absolute	relative	absolute	relative	absolute	relative
Australia	-2.19	-14.26	-3.25	-21.67	-3.42	-17.05	-1.34	-10.07
Austria	-19.55	-5.19	13.29	3.40	-59.28	-12.01	-7.46	-2.33
Belgium	-104.49	-22.05	-62.33	-13.34	-174.29	-28.13	-84.25	-20.57
Bulgaria	-11.22	-18.59	-4.86	-9.06	-18.02	-23.82	-9.86	-17.85
Canada	-22.01	-28.62	-10.67	-14.05	-30.75	-29.35	-21.13	-32.74
Cyprus	-0.11	-9.43	-0.66	-47.01	-0.26	-15.97	0.11	11.67
Czech Republic	-75.61	-16.09	-50.02	-9.90	-101.86	-17.37	-70.65	-17.34
Germany	-769.98	-22.18	-540.03	-15.05	-1001.56	-22.41	-727.42	-24.36
Denmark	-24.84	-22.70	-24.18	-22.14	-29.04	-20.54	-23.11	-24.34
Spain	-35.07	-13.62	-38.91	-14.31	-40.16	-12.19	-31.71	-14.37
Estonia	14.25	9.35	56.12	46.53	10.00	5.03	4.76	3.40
Finland	-89.30	-17.47	-51.61	-10.02	-118.65	-18.79	-86.23	-18.95
France	-162.75	-21.18	-77.17	-9.45	-307.39	-29.36	-120.35	-19.14
United Kingdom	-119.40	-20.24	-21.95	-3.81	-175.76	-23.03	-120.35	-23.37
Georgia	12.73	239.27	18.69	689.12	15.51	204.40	9.85	196.83
Greece	-7.30	-21.43	-7.91	-26.17	-12.28	-29.31	-4.87	-15.43
Hungary	-97.39	-32.47	-74.41	-23.31	-142.63	-38.27	-83.09	-31.76
Ireland	4.58	8.79	-4.95	-9.01	34.02	53.51	-6.19	-13.41
Italy	-67.34	-6.97	26.52	2.71	-173.38	-13.19	-44.73	-5.55
Japan	-167.24	-19.97	-112.41	-11.98	-199.46	-18.81	-167.55	-23.65
Lithuania	-13.40	-3.09	30.19	8.36	-83.67	-14.26	6.66	1.74
Luxembourg	-4.94	-30.59	-8.58	-37.05	-6.06	-31.38	-3.44	-26.86
Latvia	-25.67	-20.08	-4.82	-4.20	-45.14	-30.05	-22.50	-18.57
Malta	-0.13	-28.26	-0.26	-65.31	-0.29	-57.97	-0.01	-3.29
Montenegro	0.08	28.52	0.35	123.37	0.11	30.58	0.00	0.27
Netherlands	-171.97	-23.15	-189.44	-23.96	-242.85	-25.68	-134.98	-21.18
Norway	-2.78	-11.36	-0.56	-2.90	-10.66	-29.01	0.20	0.96
New Zealand	-0.73	-16.64	-1.28	-27.33	0.30	5.38	-0.95	-24.70
Poland	-147.77	-18.69	-94.16	-12.21	-294.85	-28.20	-95.54	-14.05
Portugal	-0.73	-3.70	1.12	5.46	-2.38	-8.90	-0.32	-1.92
Romania	6.95	5.11	20.44	15.47	2.32	1.32	5.38	4.52
Slovakia	-76.25	-27.33	-93.53	-28.86	-78.02	-22.50	-70.73	-29.99
Slovenia	0.81	0.84	1.35	1.35	-8.97	-7.16	5.11	6.20
Sweden	-34.64	-13.52	35.84	16.71	-72.22	-20.86	-36.78	-16.23
Ukraine	-406.92	-35.50	-794.12	-47.42	-92.69	-8.75	-465.43	-47.41
United States	18.52	3.25	73.00	12.69	-32.61	-4.41	26.90	5.47
average	-70.43	-18.09	-55.56	-13.50	-97.67	-19.47	-62.09	-18.71
cumulative	-2605.95	-18.09	-2055.54	-13.50	-3515.97	-19.47	-2235.37	-18.71

Note: Losses are per month. Absolute losses are in millions of USD. Relative losses are in percent. "Total" is the average monthly loss since December 2013; "Conflict" losses are the average monthly losses incurred during the time of conflict before the imposition of financial sanctions in mid-March 2014; "Smart sanctions" are the monthly losses during the time of conflict and financial sanctions before the imposition of economic sanctions in late July/early August 2014; "Economic sanctions" are average monthly losses incurred since the imposition of trade and banking restrictions.

Table B.7: Losses of non-embargoed products trade by period and country

B.5 Robustness Checks

B.5.1 Country-level Gravity Estimation

	<i>Dependent variable:</i>		
		log(imports)	
	(1)	(2)	(3)
Dec '13 - Feb '14	0.188 (0.185)	-0.089 (0.257)	0.191 (0.186)
Mar '14 - Jul '14	-0.311 ^b (0.124)	-0.302 (0.192)	-0.312 ^b (0.124)
since Aug '14	-0.192 ^c (0.102)	-0.242 ^c (0.135)	-0.198 ^c (0.103)
Type of product	total	embargoed products	non-embargoed products
Observations	257,072	173,519	255,452
R ²	0.951	0.926	0.950
Adjusted R ²	0.932	0.891	0.930
Residual Std. Error	0.818 (df = 184710)	0.890 (df = 117744)	0.845 (df = 183380)

Notes: All regression include exporter \times date, importer \times date and exporter \times importer \times month fixed effects. Robust standard errors in parentheses are clustered by exporter \times importer \times month. Significance levels: ^c: $p < 0.1$, ^b: $p < 0.05$, ^a: $p < 0.01$.

Table B.8: Effect on value of trade with Russia by type of product and period

B.5.2 Firm-level Estimation

HS 4:	(1)	(2)		(3)	(4)	(5)		(6)
	All	Export probability		Non-embargoed	All	Ln(export value)		Non-embargoed
		Embargoed				Embargoed		
Russia	-0.009	-0.055		-0.009	0.145 ^b	0.887		0.135 ^c
× Dec2013–Feb2014	(0.006)	(0.112)		(0.006)	(0.073)	(0.924)		(0.073)
Russia	-0.011 ^b	-0.073		-0.011 ^b	0.141 ^b	0.431		0.139 ^b
× Mar2014–Jul2014	(0.005)	(0.093)		(0.005)	(0.063)	(0.790)		(0.063)
Russia	-0.025 ^a	-0.404 ^a		-0.022 ^a	0.140 ^c	-0.767		0.142 ^c
× Aug2014–Dec2014	(0.006)	(0.103)		(0.006)	(0.073)	(1.256)		(0.073)
$\hat{\Theta}_{dt}$	0.025	-0.088		0.026	0.608 ^a	1.234		0.601 ^a
	(0.018)	(0.290)		(0.018)	(0.206)	(2.176)		(0.206)
Nb. Obs.	1016928	17676		99252	201894	5126		196768
R ²	0.874	0.941		0.872	0.978	0.988		0.978
% change in predicted probability of exporting to Russia								
Dec '13–Feb '14	-3.7	-13.0		-3.7				
Mar '14–Jul '14	-4.4	-19.1		-4.4				
Aug '14–Dec '14	-10.6	-82.8		-9.3				

Notes: All regression include Firm × Destination × HS4 and Firm × time × HS4 fixed effects. Robust standard errors in parentheses are clustered by Firm × HS4. Significance levels: ^c: p<0.1, ^b: p<0.05, ^a: p<0.01.

Table B.9: Robustness check: Alternative control group

HS 4	(1)	(2)	(3)
	All	Embargoed	Non-embargoed
Russia × Dec2013–Feb2014	-0.295 ^a	-0.292 ^b	-0.298 ^a
	(0.018)	(0.142)	(0.018)
Russia × Mar2014–Jul2014	-0.395 ^a	-0.718 ^a	-0.388 ^a
	(0.017)	(0.151)	(0.017)
Russia × Aug. 2014–Dec. 2014	-0.513 ^a	-3.069 ^a	-0.464 ^a
	(0.021)	(0.240)	(0.021)
$\hat{\Theta}_{dt}$	0.334 ^a	0.662 ^a	0.329 ^a
	(0.029)	(0.212)	(0.029)
Export _{i,d,t-12}	0.372 ^a	0.659 ^a	0.366 ^a
	(0.005)	(0.041)	(0.005)
Nb. Obs.	3353148	63576	3289572
Pseudo R ²	0.0102	0.0485	0.0099
% change in predicted conditional probability of exporting to Russia			
Dec2013 - Feb2014	-24.0	-23.1	-24.2
Mar2014 - Jul2014	-29.1	-46.6	-28.9
Aug2014 - Dec2014	-36.8	-94.8	-33.9

Notes: All regression include Firm × Destination × HS4 fixed and time effects. Robust standard errors in parentheses are clustered by Firm × Destination × HS4. Logit estimates. Significance levels: ^c: p<0.1, ^b: p<0.05, ^a: p<0.01.

Table B.10: Benchmark regressions: Export probability - Logit

Appendix C

Politics of Global Value Chains

C.1 Dependence Measure with BEA Input-Output Table

	BEA Industry	Dependence
1	Oil and gas extraction	13.12
2	Petroleum refineries	4.14
3	Insurance carriers	3.31
4	Iron and steel mills and ferroalloy manufacturing	1.73
5	Other motor vehicle parts manufacturing	1.62
6	Computer terminals and other computer peripheral equipment manufacturing	1.36
7	Pharmaceutical preparation manufacturing	1.26
8	Management consulting services	1.21
9	Other basic organic chemical manufacturing	1.19
10	Motor vehicle gasoline engine and engine parts manufacturing	1.17
11	Semiconductor and related device manufacturing	0.84
12	Other electronic component manufacturing	0.81
13	Motor vehicle transmission and power train parts manufacturing	0.81
14	Other plastics product manufacturing	0.72
15	Fishing, hunting and trapping	0.70
16	Telephone apparatus manufacturing	0.69
17	Plastics material and resin manufacturing	0.67
18	Primary smelting and refining of nonferrous metal (except copper and aluminum)	0.66
19	Other engine equipment manufacturing	0.64
20	Broadcast and wireless communications equipment	0.63
21	Motor vehicle electrical and electronic equipment manufacturing	0.63
22	Motor vehicle steering, suspension component (except spring), and brake systems manufacturing	0.63
23	Valve and fittings other than plumbing	0.54
24	Other fabricated metal manufacturing	0.52
25	Aircraft engine and engine parts manufacturing	0.49
26	Fertilizer manufacturing	0.49
27	Veneer, plywood, and engineered wood product manufacturing	0.47
28	Architectural, engineering, and related services	0.45
29	Alumina refining and primary aluminum production	0.44
30	Sawmills and wood preservation	0.43
31	Paper mills	0.43
32	Motor and generator manufacturing	0.42
33	Other aircraft parts and auxiliary equipment manufacturing	0.40
34	Computer storage device manufacturing	0.40
35	Air transportation	0.38
36	Lighting fixture manufacturing	0.38
37	Glass and glass product manufacturing	0.37
38	Fruit and tree nut farming	0.37
39	Communication and energy wire and cable manufacturing	0.36
40	Petrochemical manufacturing	0.36
41	Hardware manufacturing	0.36
42	Tire manufacturing	0.35
43	Aluminum product manufacturing from purchased aluminum	0.33
44	Surgical appliance and supplies manufacturing	0.32
45	Advertising, public relations, and related services	0.32
46	Other basic inorganic chemical manufacturing	0.32
47	Audio and video equipment manufacturing	0.31
48	Fabric mills	0.30
49	Flavoring syrup and concentrate manufacturing	0.30
50	Clay product and refractory manufacturing	0.30

Table C.1: Top 25 US critical industries with BEA Input-Output table

C.2 Press Releases from Ministries of Foreign Affairs

C.2.1 Links to Websites of Foreign Ministries

- France: <http://www.diplomatie.gouv.fr/en/>
- Germany: <http://www.auswaertiges-amt.de/>
- Japan: <http://www.mofa.go.jp>
- Russian Federation: <http://www.mid.ru/>
- United Kingdom: <http://www.gov.uk/government/organisations/foreign-commonwealth-office>

C.2.2 List of Events

Table C.2: List of events

Date	Origin	Destination	Event type	Comments
18/02/2010	France	Israel	summon CA	about murder of a Hamas member in Dubai
01/03/2010	Russia	Estonia	summon Ambassador	unfriendly action by authorities
14/07/2010	Russia	United States	summon Ambassador	protest apprehension of Russian citizen abroad
10/08/2010	Russia	Thailand	summon Ambassador	extradition of citizen to USA
01/09/2010	UK	Kenya	summon HC	about President Bashir of Sudan's visit to Kenya
27/09/2010	Japan	China	summon Ambassador	express concerns about detained Japanese nationals in China
14/10/2010	Russia	Canada	summon CA	confiscation and arrest of crew of cruise ship
01/11/2010	Russia	Japan	summon Ambassador	protest to protest presidents travel to disputed island
03/11/2010	Russia	Canada	summon CA	new visa requirements
19/11/2010	Russia	Canada	summon Ambassador	protest about damaged consulate
17/12/2010	Russia	United States	summon Ambassador	military exercise in South Korea
17/12/2010	Russia	South Korea	summon Ambassador	military exercise in South Korea
22/12/2010	Germany	Belarus	summon Ambassador	opposition arrests
20/01/2011	Germany	Belarus	summon Ambassador	accusations of plot
11/02/2011	France	Mexico	summon Ambassador	concerning situation of Florence Cassez
17/02/2011	France	Iran	summon Ambassador	concern about Spanish diplomat arrest
21/02/2011	UK	Libya	summon Ambassador	concern about violence in Lybia
02/03/2011	UK	Yemen	summon CA	concern over escalating violence in Yemen

Table C.2 — *Continued on next page*

Table C.2 — Continued from previous page

04/03/2011	Germany	Taiwan	summon Ambassador	executions
16/03/2011	UK	Libya	summon Ambassador	discuss situation in Lybia
24/03/2011	Germany	Yemen	summon Ambassador	political situation
19/04/2011	UK	Malawi	summon CA	about considering declaring the British HC persona non grata
26/04/2011	Germany	Syria	summon Ambassador	violence in Syria
27/04/2011	France	Syria	summon Ambassador	condemnation of violence in Syria
27/04/2011	UK	Syria	summon Ambassador	stop violence
28/04/2011	UK	Malawi	expulsion of HC	after expulsion of British HC
01/05/2011	UK	Libya	expulsion of Ambassador	following attack on British residence in Tripoli
13/05/2011	UK	Syria	summon Ambassador	concern about the ongoing situation in Syria
25/05/2011	Japan	South Korea	summon Ambassador	protest against members of parliament on disputed islands
31/05/2011	Germany	Syria	summon Ambassador	torture of children and teenagers
02/06/2011	Russia	Pakistan	summon Ambassador	demand investigation into deaths of four citizens
04/06/2011	Germany	Yemen	closure of German embassy	due to dangerous internal conflict
09/06/2011	Iran	UK	summon CA	UK CA was summoned by Iranian mfa
28/06/2011	UK	Syria	summon Ambassador	over allegations of Syrian Embassy intimidation
06/07/2011	Russia	Sweden	summon CA	protest court ruling
10/07/2011	France	Syria	recall its Ambassador for consultations	protest against demonstrations in front of the French embassies
12/07/2011	Germany	Syria	summon Ambassador	violence and attacks on embassies
13/07/2011	UK	Syria	summon Ambassador	ensure Syrian Ambassador protects diplomatic mission

Table C.2 — Continued on next page

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27/07/2011	France	Burundi	summon Ambassador	Patrice Faye sentence
27/07/2011	UK	Libya	expulsion of all diplomatic staff	condemnation of Qadhafi's regime
11/08/2011	France	Ukraine	summon Ambassador	About the Timochenko case
25/08/2011	Japan	China	summon Ambassador	protest against Chinese boat in territorial waters
29/09/2011	Germany	Iran	summon Ambassador	protest death penalty sentence against pastor
13/10/2011	UK	Syria	summon Ambassador	concern about reports suggesting harassment and intimidation of Syrian diplomats in UK
14/11/2011	France	Syria	summon Ambassador	concerning assaults in diplomatic entities in Syria
15/11/2011	France	Syria	recall its Ambassador for consultations	concerns about situation in Syria
16/11/2011	France	Israel	summon Ambassador	about the raid in Gaza
27/11/2011	Iran	UK	expulsion of British Ambassador	following a vote at the Iranian Parliament
29/11/2011	UK	Iran	summon CA	storming of British Embassy in Teheran
30/11/2011	France	Iran	recall its Ambassador for consultations	concerns about assaults in British embassy
30/11/2011	UK	Iran	expulsion of all diplomatic staff	in response to the assault on the British Embassy in Teheran ("closing of Iranian embassy in London by UK")
30/11/2011	UK	Iran	closure of British Embassy (Teheran)	in response to the assault on the British Embassy in Teheran
16/12/2011	UK	Uruguay	summon Ambassador	response to 25th Dec Mercosur statement about Falkland Islands

Table C.2 — Continued on next page

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23/12/2011	Turkey	France	recall its Ambassador for consultations	protest against French law proposal
02/01/2012	Congo	France	summon Ambassador	about assault of Leon Kengo Wa Dondo in Paris
06/02/2012	UK	Syria	summon Ambassador	Siege in Homs; condemnation of atrocities
07/02/2012	France	Syria	recall its Ambassador for consultations	concerns about situation in Syria
07/02/2012	Germany	Syria	summon Ambassador	spying on opposition in Germany
09/02/2012	Germany	Syria	expulsion of diplomats	four embassy staffers expelled
20/02/2012	France	Rwanda	recall its Ambassador for consultations	Kigali refuses to accept Helene Le Cal as new French Ambassador
22/02/2012	UK	Syria	summon Ambassador	stop violence in Homs
28/02/2012	France	Belarus	summon Ambassador	protest against Bielorus' decision to expel Polish and UE ambassadors
29/02/2012	UK	Belarus	recall its Ambassador for consultations	Belarus' decision to recall their Ambassadors to Poland and the EU in response to EU sanctions
29/02/2012	UK	Belarus	summon Ambassador	Belarus' decision to recall their Ambassadors to Poland and the EU in response to EU sanctions
29/02/2012	UK	Argentina	summon CA	response to Argentina's threat to trade
01/03/2012	UK	Syria	withdrawal diplomatic staff	all diplomatic staff
03/03/2012	Germany	Iran	summon Ambassador	call for release of pastor
21/03/2012	Japan	Syria	closure of Japanese embassy	deteriorating security situation
06/04/2012	France	Hungary	summon Ambassador	concerns about situation of foreign investors in Hungary

Table C.2 — Continued on next page

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13/04/2012	UK	North Korea	summon Ambassador	concerns about satellite launch
28/05/2012	UK	Syria	summon CA	UK's condemnation of the appalling massacre which took place in al-Houleh
29/05/2012	UK	Syria	expulsion CA and diplomates	response to killing in el-Houleh
29/05/2012	Germany	Syria	expulsion of diplomats	ambassador expelled
03/07/2012	Japan	Russia	summon Ambassador	protest against visit of Russian prime minister on disputed island
11/07/2012	Japan	China	summon Ambassador	protest against entry of patrol ships into disputed territorial waters
12/07/2012	Japan	China	summon Ambassador	protest against entry of patrol ships into disputed territorial waters (again..)
12/08/2012	Japan	Russia	summon Ambassador	express concerns about situation in Georgia
14/08/2012	Germany	Belarus	summon Ambassador	protest closing of Swedish embassy
15/08/2012	Japan	China	summon Ambassador	protest against landing of activist ships on disputed islands
20/09/2012	Germany	Belarus	summon Ambassador	protest visa rejecting of election observers
03/10/2012	Russia	Libya	summon CA	attack on embassy in Tripolis
30/10/2012	UK	Burma	summon CA	concern about the violence in Rakhine State
15/11/2012	UK	Spain	summon Ambassador	concerns regarding incursions into British Gibraltar Territorial Waters
03/12/2012	France	Israel	summon Ambassador	concerns about settlement in colonies
03/12/2012	UK	Israel	summon Ambassador	concern about settlement policy
03/12/2012	Germany	North Korea	summon Ambassador	protest missile test
12/12/2012	UK	North Korea	summon Ambassador	condemnation satellite launch

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12/12/2012	Russia	Nigeria	summon Ambassador	ship crew detained
12/12/2012	Germany	North Korea	summon Ambassador	protest rocket launch
13/12/2012	Japan	China	summon Ambassador	protest against entry of aircraft and ships into disputed territory
08/02/2013	Japan	China	summon Ambassador	protest against entry of Chinese ship into territorial waters
13/02/2013	France	Iraq	call for minister meeting	Situation of Nadir Dendoune
01/03/2013	Germany	China	summon Ambassador	protest attack on German journalist
05/04/2013	Germany	North Korea	summon Ambassador	concern about tensions on Korean peninsula
13/05/2013	Russia	United States	summon Ambassador	unclear
01/07/2013	Germany	United States	summon Ambassador	spying on Germany
11/07/2013	Russia	Montenegro	summon Ambassador	situation of citizen
02/08/2013	UK	Spain	summon Ambassador	delays at the Gibraltar border
20/08/2013	Japan	Egypt	summon Ambassador	call for peaceful solution to domestic conflict
19/09/2013	Russia	Netherlands	summon Ambassador	flying flag close to Russian shore
03/10/2013	Russia	Libya	withdrawal diplomatic staff	following attack on Russian embassy
08/10/2013	Russia	Netherlands	summon Ambassador	protest about Russian diplomat attacked
16/10/2013	Russia	Costa Rica	summon Ambassador	extradition of citizen to USA
21/10/2013	France	US	summon Ambassador	spying on France
12/11/2013	Russia	Poland	summon Ambassador	protest about violence around embassy
19/11/2013	UK	Spain	summon Ambassador	serious incursion into British Gibraltar Territorial Waters

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23/11/2013	Japan	China	summon CA	protest against Chinese declaration of territorial extent
25/11/2013	Japan	China	summon Ambassador	protest against Chinese declaration of territorial extent
24/01/2014	France	Ukraine	summon Ambassador	concerns about violence in Ukraine
24/01/2014	Germany	Ukraine	summon Ambassador	concerns about violence in Ukraine
20/02/2014	UK	Ukraine	summon Ambassador	over violence in Ukraine
24/02/2014	France	Morocco	summon Ambassador	discuss situation of M.Hammouchi
25/02/2014	France	Morocco	Ministers meeting	discuss about diplomatic incident with French ambassador in DC
01/03/2014	UK	Russia	summon Ambassador	concerns about situation in Ukraine
02/04/2014	UK	Spain	summon Ambassador	concern at the incursion into British Gibraltar Territorial Waters
03/04/2014	Russia	Germany	summon Ambassador	statement of German Minister of Finance
07/04/2014	UK	Burma	summon Ambassador	call for urgent restoration of humanitarian access
07/04/2014	Germany	North Korea	summon Ambassador	concern about Nuclear test
29/04/2014	Germany	Egypt	summon Ambassador	urgent appeal against death sentences
19/05/2014	UK	Sudan	summon CA	concern at the decision to sentence MYII to death for apostasy
26/05/2014	Japan	China	summon Ambassador	protest against entry of military aircraft into territory
11/06/2014	Japan	China	summon Ambassador	protests against two Chinese military jets which flew abnormally close to two Japan's Self Defence Force
12/06/2014	Japan	China	summon Ambassador	protest against entry of military aircraft into territory (again..)
23/06/2014	UK	Egypt	summon Ambassador	concerning verdicts against Egyptian and international journalists

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13/07/2014	Russia	Ukraine	summon CA	protest killing of citizen by shelling
17/07/2014	UK	Spain	summon Ambassador	concern at the activity of a Spanish Navy vessel in Gibraltar the day before
19/07/2014	UK	Russia	summon Ambassador	urged Russian Authorities to secure access to flight MH17 crash site
04/08/2014	UK	Ethiopia	summon CA	concern about arrest of a Briton
15/08/2014	UK	Russia	summon Ambassador	account for reports overnight of Russian military vehicles crossing the border into Ukraine
18/08/2014	Turkey	Germany	summon Ambassador	activities about Federal Intelligence Agency
13/10/2014	UK	Thailand	summon CA	concern about the investigation into murders of HW and DM

C.3 Robustness: Gravity Estimation

	Dependent variable:			
	log(imports)			
	(1)	(2)	(3)	(4)
log(pol_relations)	0.377*** (0.013)	0.081*** (0.009)	0.392*** (0.008)	0.054*** (0.007)
log(dependence)	0.059*** (0.008)	0.066*** (0.008)		
log(pol_relations):log(dependence)	0.009*** (0.001)	0.010*** (0.001)	0.005*** (0.001)	0.007*** (0.001)
log(distance)	-1.020*** (0.021)		-1.196*** (0.008)	
rta	0.461*** (0.035)	0.069*** (0.018)	0.507*** (0.013)	0.065*** (0.012)
comcur	-0.079 (0.056)	0.304*** (0.051)	0.015 (0.023)	0.305*** (0.035)
Fixed effects	ctry-yr,ind	ctry-yr,ind,ctry-pair	ctry-yr-ind	ctry-ind-yr,ctry-pair
Observations	1,624,297	1,626,541	1,624,297	1,626,541
R ²	0.462	0.510	0.710	0.758
Adjusted R ²	0.461	0.505	0.688	0.737

Notes: Standard errors are clustered at the exporter \times importer \times industry level. Significance levels: *p<0.1; **p<0.05; ***p<0.01

Table C.3: Gravity with GTAP industry level data

To measure the state of political relations between two countries, we rely on the *importance* and *mood* indicators developed by in section 1. See the appendix A.4 for a discussion of the aggregation technique and descriptive statistics. For trade data we turn to UN Comtrade data from 2000 to 2010 (United Nations Statistics Division, 2015). We include a number of standard gravity controls: RTAs, common currency, common language and common colonial history are sourced from CEPII (Head et al., 2010) and distances are taken from chapter 4.

Table C.3 shows the results for estimating equation (3.5) with disaggregated data and interacting the political relations variable with the measure of dependence. The variable *pol_relations* is economically and statistically significant throughout—even when including high dimensional fixed effects. More interesting though now is its interaction with the *dependence*

measure. In the benchmark estimation (column 1) we include importer \times year, exporter \times year and industry fixed effects. As noted, this result is robust to country \times pair fixed effects (column 2). This suggests a heterogeneity in the effect of political relations on imports along the lines of the dependence of the country on the respective industry. The magnitude of the coefficient however drops drastically when including importer \times industry \times year and exporter \times industry \times year and exporter \times importer fixed effects. This is unsurprising however, as it removes a lot of the variation in the data. The results remain highly significant throughout. All other gravity covariates yield customary coefficient point estimates.

Appendix D

Time-varying Distances in the Gravity Model

D.1 Theoretical Appendix

D.1.1 Aggregation for Structural Gravity

Following Head and Mayer (2014), structural gravity is defined as

$$X_{kl} = \frac{Y_k}{\Omega_k} \cdot \frac{X_l}{\Phi_l} \cdot \phi_{kl}^\theta$$

where $Y_k = \sum_l X_{kl}$ is the value of production (i.e. exports) in k , $X_l = \sum_k X_{kl}$ is the value of all expenditure (i.e. imports) in l , and

$$\Omega_k = \sum_l \frac{X_l \phi_{kl}^\theta}{\Phi_l} \quad \text{and} \quad \Phi_l = \sum_k \frac{Y_k \phi_{kl}^\theta}{\Omega_k}$$

are the multilateral resistance terms. For all $k \in i$ and $l \in j$ call $Y_i = \sum_{k \in i} Y_k$ and $X_j = \sum_{l \in j} X_l$, the total value of production in i and expenditure in j respectively. Then

$$\begin{aligned} X_{ij} &= \sum_{k \in i} \sum_{l \in j} X_{kl} \\ &= \sum_{k \in i} \sum_{l \in j} \frac{Y_k}{\Omega_k} \cdot \frac{X_l}{\Phi_l} \cdot \phi_{kl}^\theta \end{aligned}$$

Multiply and divide by the sum of all exporter and importer-specific terms, such that

$$X_{ij} = \sum_{k \in i} Y_k / \Omega_k \cdot \sum_{l \in j} X_l / \Phi_l \cdot \sum_{k \in i} \sum_{l \in j} \frac{Y_k / \Omega_k}{\sum_{k \in i} Y_k / \Omega_k} \frac{X_l / \Phi_l}{\sum_{l \in j} X_l / \Phi_l} \phi_{kl}^\theta$$

The sum of importer and exporter-specific terms can be simplified further,

as

$$\begin{aligned} \sum_{k \in i} \frac{Y_k}{\Omega_k} &= \frac{Y_i}{Y_i} \sum_{k \in i} \frac{Y_k}{\Omega_k} \\ &= Y_i \sum_{k \in i} \frac{Y_k}{Y_i} \Omega_k^{-1} \\ &= \frac{Y_i}{\Omega_i} \quad \text{with} \quad \Omega_i = \left(\sum_{k \in i} \frac{Y_k}{Y_i} \Omega_k^{-1} \right)^{-1} \end{aligned}$$

and accordingly

$$\sum_{k \in i} \frac{X_l}{\Phi_l} = \frac{X_j}{\Phi_j} \quad \text{with} \quad \Phi_j = \left(\sum_{l \in j} \frac{X_l}{X_j} \Phi_l^{-1} \right)^{-1}$$

The entity-level multilateral resistance terms are hence the harmonic mean of multilateral resistances of locations, weighted by their share in the value of production or expenditure, respectively.¹

Finally putting it all together yields

$$\begin{aligned} X_{ij} &= \frac{Y_i}{\Omega_i} \cdot \frac{X_j}{\Phi_j} \cdot \sum_{k \in i} \sum_{l \in j} \frac{Y_k/\Omega_k}{Y_i/\Omega_i} \frac{X_l/\Phi_l}{X_j/\Phi_j} \phi_{kl}^\theta \\ &= \frac{Y_i}{\Omega_i} \cdot \frac{X_j}{\Phi_j} \cdot \phi_{ij}^\theta \quad \text{with} \quad \phi_{ij} = \left(\sum_{k \in i} \sum_{l \in j} \frac{Y_k/\Omega_k}{Y_i/\Omega_i} \frac{X_l/\Phi_l}{X_j/\Phi_j} \phi_{kl}^\theta \right)^{\frac{1}{\theta}} \end{aligned} \quad (\text{D.1})$$

which is isomorphic to equation (4.1).

¹See also Ramondo et al. (2012), whose aggregation over regions yields a similar country-level price index.

D.2 Processing of Satellite Imagery and Validity Checks

The United States Air Force Defense Meteorological Satellite Program (DMSP) has satellites circling the planet about 14 times in 24h, image captured between 8:30pm and 10pm local time. The results are digitally available since 1992, pre-processed by NOAA (cloud-free, no fires). The resolution is 30 arc-seconds or about 860m at the equator, where the recorded data is a so-called digital number (DN), an integer between 0 and 63. The number is not necessarily true radiance, it is what the sensor picks up. In total there are about 60,000,000 illuminated cells, with variation over time.

I rasterize the raw satellite images and remove artefacts (gas flares and aurora borealis), boats, etc. I reduce the sample to illuminated landmasses by detecting borders with georeferenced border shapefiles from Weidmann et al. (2010). In line with the literature I intercalibrate across years following Elvidge et al. (2014) with:

$$DN' = c_0 + c_1DN + c_2DN^2$$

A number of years have observations from two satellites. For these years I average the intercalibrated data by cell. Using this processed data I calculate great circle distances between each illuminated cell and calculate the generalized mean as discussed above. To reduce the size of the distance matrix to be calculated while maintaining general validity, I randomly draw 100 times 1 percent and a minimum of 1000 from each country's illuminated cells.

	<i>Dependent variable:</i>	
	population (1)	gdp (2)
AT:light	0.007*** (0.001)	0.195*** (0.050)
BE:light	0.006*** (0.001)	0.153*** (0.034)
BG:light	0.014*** (0.002)	0.026 (0.078)
CY:light	0.005** (0.002)	0.072 (0.072)
CZ:light	0.006*** (0.001)	0.033 (0.021)
DE:light	0.010*** (0.001)	0.256*** (0.021)
DK:light	0.005*** (0.001)	0.140*** (0.030)
EE:light	0.004** (0.002)	0.020 (0.065)
EL:light	0.015*** (0.001)	0.203*** (0.043)
ES:light	0.008*** (0.0003)	0.139*** (0.011)
FI:light	0.001*** (0.0003)	0.035*** (0.010)
FR:light	0.006*** (0.0003)	0.135*** (0.009)
HR:light	0.008*** (0.002)	0.041 (0.070)
HU:light	0.010*** (0.001)	0.045 (0.039)
IE:light	0.004*** (0.001)	0.090*** (0.028)
IT:light	0.008*** (0.0003)	0.185*** (0.012)
LT:light	0.010*** (0.002)	0.041 (0.078)
LU:light	0.005 (0.003)	0.228** (0.103)
LV:light	0.009*** (0.003)	0.031 (0.102)
MK:light	3.114 (3.347)	4.505 (118.288)
MT:light	0.020 (0.016)	0.226 (0.552)
NL:light	0.010*** (0.001)	0.257*** (0.032)
PL:light	0.008*** (0.0005)	0.036** (0.017)
PT:light	0.009*** (0.001)	0.115*** (0.038)
RO:light	0.014*** (0.001)	0.025 (0.040)
SE:light	0.002*** (0.0002)	0.058*** (0.009)
SI:light	0.008** (0.003)	0.087 (0.106)
SK:light	0.007*** (0.001)	0.026 (0.036)
UK:light	0.007*** (0.0004)	0.169*** (0.013)
Observations	1,302	1,302
R ²	0.750	0.481
Adjusted R ²	0.744	0.470
Residual Std. Error (df = 1273)	281.959	9,965.717
F Statistic (df = 29; 1273)	131.370***	40.737***

Note: *p<0.1; **p<0.05; ***p<0.01

Table D.1: Validity check: Regressing light emissions on population and GDP figures

D.3 Validity Checks for Distance Measure

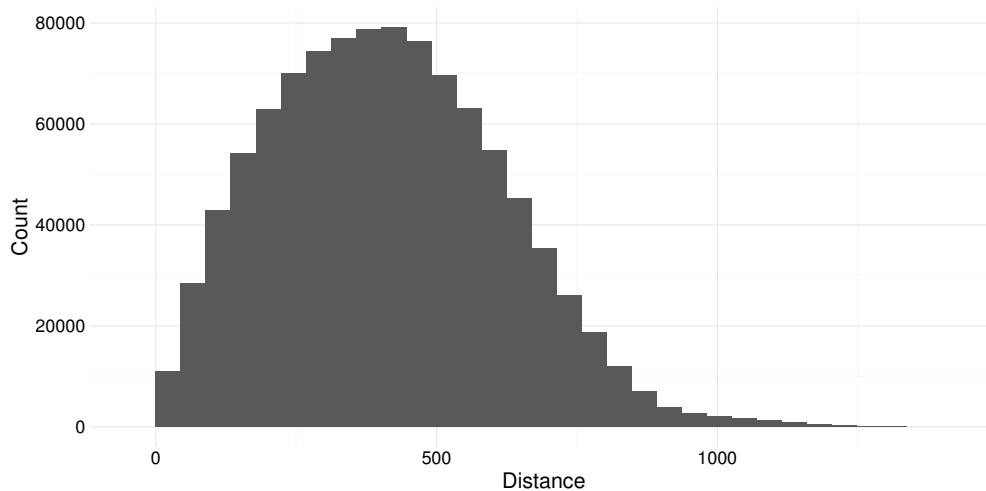


Figure D.1: Histogram of 1 million distances between random economically active locations in France (2000)

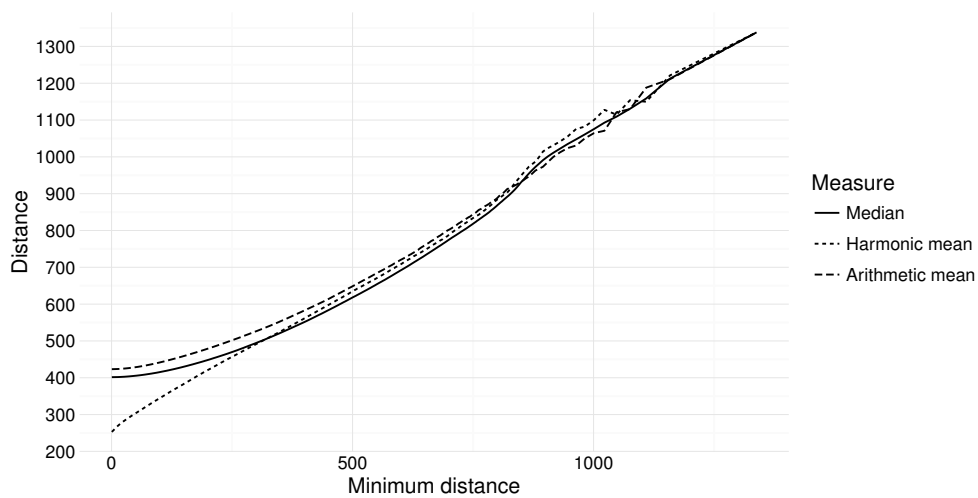


Figure D.2: Minimum distance vs. mean distance by measure for France (2000).

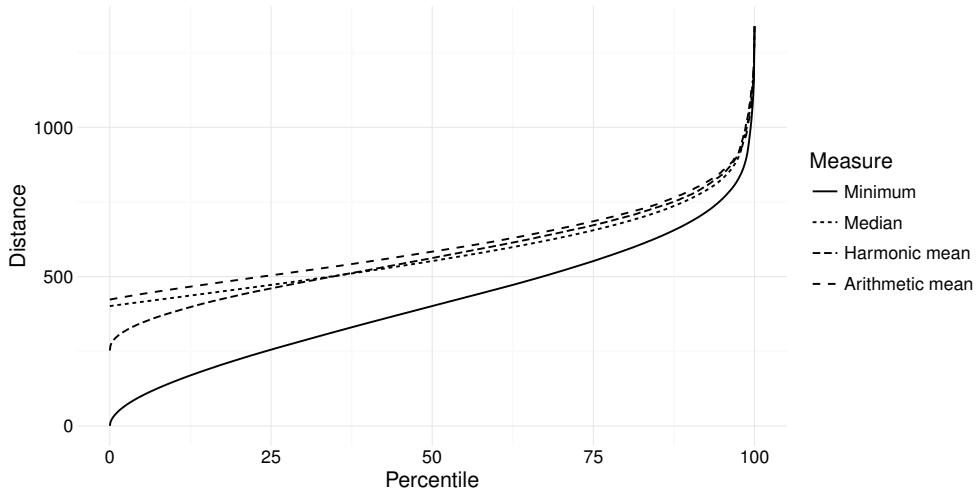


Figure D.3: Percentile of distances vs. mean distance by measure for France (2000).



Figure D.4: Change of distance (1994 = 1) after NAFTA between Mexico and the US States of Texas, New Mexico, Arizona and California.

D.4 Gravity Results

D.4.1 Border Effect

	Dependent variable:			
	log(flow)		flow	
	(1)	(2)	(3)	(4)
log(distance)	-1.544*** (0.024)	-1.496*** (0.023)	-1.143*** (0.014)	-1.029*** (0.012)
border	3.926*** (0.147)	2.332*** (0.159)	2.563*** (0.028)	2.076*** (0.031)
Estimator	OLS	OLS	PPML	PPML
Distance	arithmetic	harmonic	arithmetic	harmonic
Observations	7,584	7,584	7,584	7,584
R ²	0.786	0.789	0.789	0.789
Adjusted R ²	0.777	0.780	0.780	0.780
Residual Std. Error (df = 7288)	1.450	1.439	1.439	1.439

Notes: All regression include exporter and importer fixed effects. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table D.2: Border coefficient estimation with IMF DOTS data

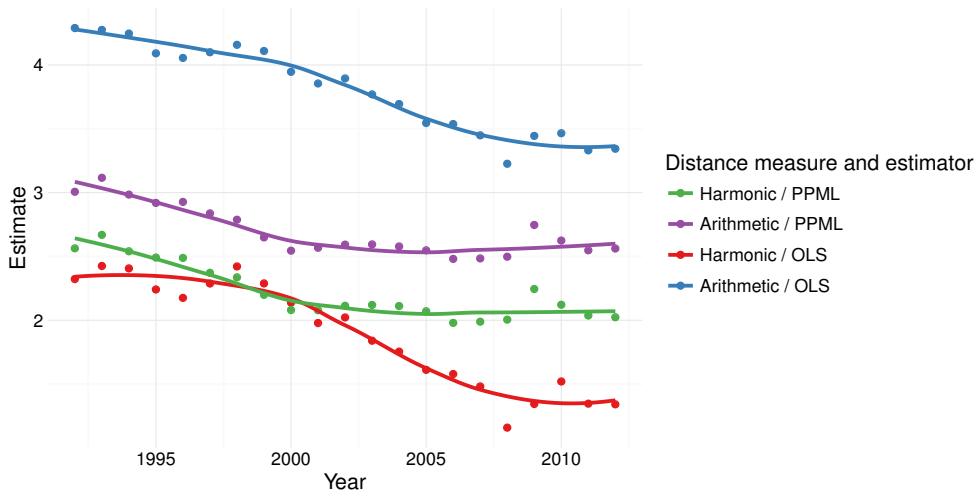


Figure D.5: Gross border coefficients from cross section estimations using OLS and PPML estimators with IMF DOTS data.

D.4.2 Effect on other Variables

	Dependent variable:			
	log(flow)		flow	
	(1)	(2)	(3)	(4)
log(distance)	-1.321*** (0.031)	-1.279*** (0.030)	-0.592*** (0.017)	-0.531*** (0.015)
neighbor	0.359*** (0.095)	0.202** (0.097)	0.367*** (0.027)	0.347*** (0.027)
rta	0.532*** (0.065)	0.544*** (0.065)	0.855*** (0.038)	0.893*** (0.038)
comcur	0.301** (0.131)	0.299** (0.131)	-0.029 (0.035)	-0.059* (0.036)
colony	1.049*** (0.105)	1.047*** (0.105)	0.048 (0.033)	0.073** (0.032)
comlang off	0.199*** (0.059)	0.200*** (0.059)	0.052* (0.031)	0.019 (0.031)
comleg	0.335*** (0.042)	0.334*** (0.042)	0.186*** (0.021)	0.186*** (0.021)
Estimator	OLS	OLS	PPML	PPML
Distance	arithmetic	harmonic	arithmetic	harmonic
Observations	8,340	8,340	8,340	8,340
R ²	0.773	0.772		
Adjusted R ²	0.764	0.763		
Residual Std. Error (df = 8009)	1.440	1.441		

Notes: All regression include exporter and importer fixed effects. Significance levels:
 *: p<0.1, **: p<0.05, ***: p<0.01.

Table D.3: Gravity co-variates estimation with IMF DOTS data

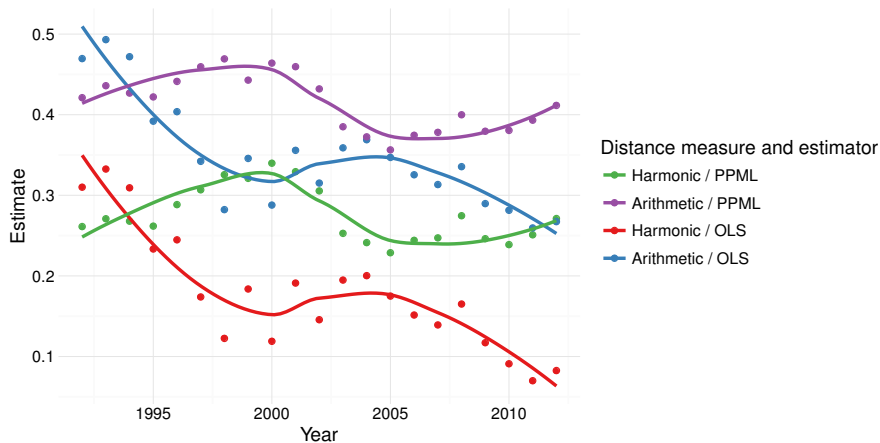


Figure D.6: Neighbor coefficient over time by estimation method

Essays on International Trade and Foreign Policy

Le sujet de cette thèse porte sur l'analyse des liens entre la politique étrangère et le commerce international, hormis un chapitre qui est de nature plus méthodologique. Dans le chapitre 1, j'étudie dans quelle mesure les intérêts géopolitiques sont une motivation essentielle pour la formation d'accords d'intégration économique. Les grands pays négocient et signent systématiquement des accords avec des pays plus petits qui offrent plus d'avantages en termes politiques qu'en termes économiques. Le chapitre 2 propose une analyse empirique sur les effets des sanctions sur les pays sanctionnant, et plus particulièrement sur leurs exportations. Dans ce travail en collaboration avec Matthieu Crozet, nous examinons l'impact global du régime de sanctions contre la Fédération de Russie sur les flux d'exportation des pays occidentaux, et l'impact micro sur les entreprises exportatrices françaises. Le chapitre 3 centre son analyse sur l'étude du mécanisme par lequel les relations politiques entre pays influent leurs flux commerciaux. Conjointement avec Elsa Leromain, nous montrons comment les pays adaptent leur mode d'approvisionnement au climat politique avec leur partenaire commercial. Enfin, dans le chapitre 4, j'explore une question méthodologique en établissant la façon dont les coûts commerciaux devraient être agrégés des niveaux inférieurs d'agrégation géographique au plus élevés en prenant l'exemple de la définition des distances moyennes entre pays en utilisant l'imagerie satellite sur l'émission de lumière nocturne pour mesurer l'activité économique locale.

Mots-clés: commerce international, politique étrangère, cadre de gravité, sanctions, coût de commerce

Essays on International Trade and Foreign Policy

The subject of this doctoral thesis revolves around the analysis of the links between foreign policy and international trade, along with one chapter that is of more methodological nature. In chapter 1 I show how geopolitical interests are a key motivation for economic integration agreements. Big countries systematically negotiate and sign these agreements with smaller countries that offer political benefits at the expense of economic ones. Chapter 2 provides an empirical analysis into the effect of sanctions on sanctioning countries—their exports in particular. In this joint work with Matthieu Crozet, we study the macro-impact of the sanctions regime against the Russian Federation on export flows from Western countries and the micro-impact on French exporting firms. Chapter 3 takes a closer look at the mechanism through which political relations between countries impact their trade flows. A collaboration with Elsa Leromain, we show how countries adjust their input sourcing pattern to the political climate with the respective trading partner. Finally, in chapter 4 I explore the methodological issue of how trade costs should be aggregated from lower levels of geographic aggregation to higher ones and I compute theory-consistent country to country distances using nighttime satellite imagery for information on the location of economic activity.

Keywords: International trade, foreign policy, gravity framework, sanctions, trade costs