Critically important: The heterogeneous effect of politics on trade*

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Abstract

The proliferation of global value chains makes the domestic production of goods increasingly dependent on inputs from foreign sources. Political tensions between countries could have an impact on trade costs as they affect the international enforceability of contracts or result in impediments from authorities in the shipment or production process. By expanding their portfolio of foreign suppliers, firms and by extension entire economies are thus increasingly prone to the trade effects of adverse bilateral political shocks. In this paper, we aim to reassess the role of political relations on trade flows in light of these new developments and propose a new channel. We hypothesize that political relations matter more for imports of critical inputs. Critical inputs refer to inputs that a country uses intensively in its production process. We construct a simple model exhibiting input-output linkages to clarify the mechanisms at play, from which we derive testable predictions. Using a new measure for countries' dependence on these critical inputs, we then test the proposed mechanism empirically in a structural gravity framework. To address potential endogeneity issues we perform an event study, in which the treatment is an exogenous adverse political shock. Using a new dataset on the status of diplomatic representation and monthly trade data, we exploit the recalling or summoning of the ambassador of a country as a shock to bilateral political relations. Results confirm an economically and statistically significant effect that varies conditional on the dependence of the country on the imported input.

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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 Relations[1]

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 political shocks. In this paper, 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.[2] As critical goods we define foreign inputs used intensively directly and indirectly for the production of goods that are domestically consumed.[3]

We develop a simple theoretical model to illustrate the proposed mechanism. We first show that the more critical a product is, the greater are the potential damages of a change in its price on aggregate output. As political tensions affect the price of the input with the trading partner, the potential damages of a shock to political relations are greater for critical inputs. As the benefits of finding an alternative source are higher, we expect the country to change its supplier for these inputs. Hence, the response to a shock on political relations on trade should be greater for critical products. From the theoretical model we can also 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

[1] From "The great unraveling of globalization", Washington Post by Jeffrey Rothfeder on April 24, 2015.

[2] We 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).

[3] Note 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.

economically important countries (France, UK, Russia, Germany, Japan). Using these events as a proxy for a negative shock to bilateral political relations, we estimate the heterogeneous impact with *monthly* UN Comtrade import data (United Nations Statistics Division, 2015) 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 paper 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.[4] 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).

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 %.

[4] See 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.

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 paper is organized as follows. In section 2 we develop a simple model to illustrate the proposed mechanism. In section 3 we compute a measure of dependence directly derived from the model. In section 4 we test the proposed mechanism using this measure in an event study. Section 5 concludes.

2 Theory

Most of the papers studying the connection between political relations and trade use aggregate trade flows.[5] We aim to show 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. A shock to 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 from two potential sources. Political relations are assumed to enter variable trade costs. In the literature, 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 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.

First, we analyze the effect of a change of the price of an input on aggregate output. The total effect is conditional on how *dependent* the economy is on this input. The greater the

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

dependence, the bigger is the effect on aggregate output. We then examine the effect of a negative shock to political relations on trade. Relying on the previous result, we show that the response in trade flows with the partner affected by the shock is expected to be greater for critical inputs than for other inputs.

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, a 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

$$x = l_x^{\lambda_x} y_x^{\beta_x} m_x^{\gamma_x} n_x^{\delta_x} \tag{1}$$

$$y = l_y^{\lambda_y} x_y^{\alpha_y} m_y^{\gamma_y} n_y^{\delta_y} \tag{2}$$

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

The exponents in equations (1) and (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. Foreign inputs can be imported from two different sources F1 and F2. For each input, the choice of supplier will be based on the prices from each location. The domestic economy will import its inputs from the cheapest available option, as e.g. in Eaton and Kortum (2002).

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 $y_c = (1-\eta)\frac{w}{p_y}$.

Our model is a framework for understanding the effect of a specific exogenous shock, a sudden worsening of political relations. 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 as a response to a shock. Since our analysis focuses on short-term effects of a shock, it is a credible assumption. In the short-run, production technology cannot adjust. However, it is important to stress that the trade pattern can change after the shock. The domestic economy might substitute between inputs from different foreign sources.

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. As there are no imported final goods, competition on the final goods market is not affected by a shock to political relations. As there are no exports of final goods, the shock does not change the access to a foreign market for domestic final goods producers.

The first step in developing the model is to choose the supplier for each imported input (m and n), from either F1 or F2. The market for inputs is in perfect competition, both F1 and F2 sell their products at marginal cost $c_{k,i}$. We assume the technologies to be similar between sectors within a country such that $c_{m,1} = c_{n,1} = c_1$ and $c_{m,2} = c_{n,2} = c_2$. To ship the goods from the foreign countries to the domestic economy, there are iceberg trade costs τ_i. The price of a foreign input k sourced from i in the domestic market is then $p_{k,i} = \tau_i c_{k,i}$. More specifically, we have $p_{1,m} = p_{1,n} = \tau_1 c_1$ and $p_{2,m} = p_{2,n} = \tau_2 c_2$. The domestic economy will choose the cheapest source between F1 and F2 for its inputs. Hence, the price of input k in the domestic economy is set as: $p_k = \min[p_{k,1}; p_{k,2}]$. A shock to trade costs with one partner might affect the trade pattern, and hence the price of the inputs in the domestic economy.

Once the choice of the foreign input supplier is determined, 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

$$\begin{pmatrix} m \\ n \end{pmatrix} = \frac{1}{1-\alpha_y\beta_x} \begin{pmatrix} \frac{p_x}{p_m}(\gamma_x + \beta_x\gamma_y) & \frac{p_y}{p_m}(\gamma_y + \alpha_y\gamma_x) \\ \frac{p_x}{p_n}(\delta_x + \beta_x\delta_y) & \frac{p_y}{p_n}(\delta_y + \alpha_y\delta_x) \end{pmatrix} \begin{pmatrix} x_c \\ y_c \end{pmatrix} \tag{3}$$

The domestic economy is considered as being more *dependent* on input m than on input n, i.e. m is more critical than n in that the economy needs more of it 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

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

2.2 Impact of a change in input price on aggregate output

In this subsection, we show that a shock to the price of a critical input on which the economy is *dependent* has a greater impact on domestic aggregate output 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.

We first study the effect of an increase in p_m on aggregate output. Focusing on sector x, from the firm profit maximisation problem in that sector 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

$$\frac{\partial x}{\partial p_m} = -\frac{\gamma_x}{p_m}x$$

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

$$p_x = \frac{wl_x}{x\lambda_x}$$

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

$$\frac{\partial y}{\partial p_x} = -\frac{\alpha_y}{p_x} y$$

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

$$\text{TE}_x^n = -\frac{1}{p_n}(\delta_x + \beta_x \delta_y)x$$

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

$$\text{TE}_y^n = -\frac{1}{p_n}(\delta_y + \alpha_y \delta_x)y$$

If 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

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

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

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

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

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

which is equivalent to

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

We show previously that this condition is true if and only if the domestic economy is more dependent on m than on n. 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. In other words, a similar shock on the price of an input will have different effect on aggregate output conditional on its level of dependence. An increase in the price of a critical input will lead to higher damages on aggregate output than a same increase in the price of a non-critical input.

2.3 Impact of a change in political relations

In this stylized two-sector setting with imported inputs, we now consider the effect of a change in political relations on trade patterns. We first need to add assumptions to

determine ex-ante trade patterns. Ex-ante technologies and trade costs are such that: $p_{m,1} < p_{m,2}$ and $p_{n,1} < p_{n,2}$. Let ε be the price gap between F1 and F2: for $k \in \{m, n\}$, $\varepsilon = p_{k,1} - p_{k,2}$ with $\varepsilon > 0$. Before the shock, the domestic economy is sourcing all its inputs from F1. Ex-ante domestic input prices are then $p_m = \tau_1 c_1$ and $p_n = \tau_1 c_1$.

We examine the effect of a negative shock to political relations between the domestic economy and F1. As stated above and following the existing literature, we hypothesize political relations to affect variable trade costs. Hence, a negative shock to political relations between the domestic economy and F1 is modeled as an increase of τ_1. Call τ_1' the new level of trade costs such that: $\tau_1' = \tau_1 + \xi$ with $\xi > 0$. The key question is to determine how this will affect the choice of input supplier. The domestic economy has to choose from a new set of prices. As the iceberg trade cost increased with the shock, everything else being equal, the inputs from F1 are relatively more expensive. We now have $p'_{m,1} = \tau_1' c_1$ and $p'_{n,1} = \tau_1' c_1$ More generally: for $k \in \{m, n\}$, $p'_{k,1} = p_{k,1} + \zeta$ where $\zeta = \frac{\xi}{\tau_1} p_{k,1}$. τ_2 is unchanged, therefore F2 input prices are unchanged: for $k \in \{m, n\}$ $p'_{k,2} = p_{k,2} = \tau_2 c_2$. Further assume that the shock on political relations is such than F1 is no longer the cheapest source available (i.e. $\varepsilon < \zeta$). [6] Will the domestic economy change its input supplier? In principle, it should pick the new cheapest supplier for each input. However, when changing the supplier for a given input, the domestic economy incurs switching costs in the short-run, denoted sc. In a recent paper, Barrot and Sauvagnat (2016) show that switching costs between trade partners are substantial in the short-run. They are also a key element in recent models of firm's sourcing decisions (cp. Antràs et al., 2014).

Therefore, in the short-run the domestic economy faces a trade-off for each input between the benefits of switching supplier versus the cost of switching. The domestic economy decides to switch suppliers only for the inputs for which the benefits are higher than the costs. We assume sc a priori to be similar for each input (cf. discussion below). They are expressed as a share of total output, which allows the overall value to differ between sectors. The benefits from switching are more difficult to assess. As shown in the previous section, an increase in the price of an input leads to a decrease in aggregate output. The greater the price increase, the greater the decrease in total output. Minimizing the increase in price by switching to a relatively cheaper input would then minimize the output loss due to the shock. The loss in output due to the shock will be smaller when switching than the loss in output due to the shock when not switching. The greater the difference between the loss in output when switching versus not switching, the higher the benefits from switching.

[6] In case $\varepsilon \geq \zeta$, the shock is such that F1 is still the cheapest. The shock will lead to a reduction in total output, hence a reduction in trade volumes, but trade patterns won't be affected.

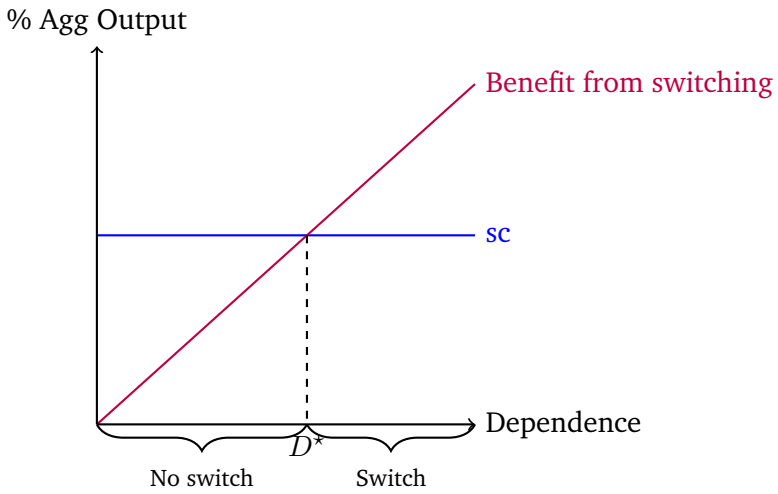


Figure 1: Trade-off

For input m the benefits from switching are:

$$|\frac{\partial \log(\text{AO})}{\partial p_m}|_{switch} - |\frac{\partial \log(\text{AO})}{\partial p_m}|_{\overline{switch}} = (\zeta - \varepsilon)\frac{1}{p_m}(\eta(\gamma_x + \beta_x\gamma_y) + (1-\eta)(\gamma_y + \alpha_y\gamma_x))$$

For input n the benefits from switching are:

$$|\frac{\partial \log(\text{AO})}{\partial p_n}|_{switch} - |\frac{\partial \log(\text{AO})}{\partial p_n}|_{\overline{switch}} = (\zeta - \varepsilon)\frac{1}{p_n}(\eta(\delta_x + \beta_x\delta_y) + (1-\eta)(\delta_y + \alpha_y\delta_x))$$

If the domestic economy is more dependent on m than on n, from the previous section we have that:

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

As $\zeta - \varepsilon > 0$

$$[\zeta - \varepsilon]\frac{1}{p_m}[\eta(\gamma_x + \beta_x\gamma_y) + (1-\eta)(\gamma_y + \alpha_y\gamma_x)] > [\zeta - \epsilon]\frac{1}{p_n}[\eta(\delta_x + \beta_x\delta_y) + (1-\eta)(\delta_y + \alpha_y\delta_x)]$$

Figure 1 represents the simple trade-off in a graph. From the figure, it is clear that the optimal strategy will be conditional on the dependence of the economy on the input. $D^\star$ denotes the dependence level at which the economy is indifferent between switching and

not switching. For non-critical inputs such that $D < D^{\star}$, it is not worth adjusting. The difference in damages on aggregate output is marginal compared to switching costs. For these inputs, there is no change in the trade pattern following the shock. Assuming n is such that $D_n < D^{\star}$, the imports of n from F1 after the shock will be lower than before, but the domestic economy still import n from F1 and not from F2. For critical products such that $D > D^{\star}$, it is worth adjusting. The trade pattern will change following the shock. Assuming m is such that $D_m > D^{\star}$, the domestic economy will stop importing m from F1 and start importing m from F2. In our simple model with only two potential suppliers, the response to the shock is different between critical and non-critical products, driven by a change at the extensive margin (switching of suppliers) and intensive margin (importing less due to higher prices). We can generalize this result in the following two testable predictions:

Prediction 1. *After a negative shock to political relations with a trade partner, trade flows with this partner should decrease for all products. The decrease is more pronounced for critical products, as the likelihood to switch is higher.*

Previously, we assumed that the switching costs were the same for all products. However, switching costs may be higher for products for which it is hard to find an alternative foreign supplier. This dimension is not encompassed in our measure of dependence. For the products with high switching costs, the threshold of dependence $D^{\star}$ for which the economy is indifferent between the two strategies is higher.

Prediction 2. *After a negative shock to political relations with a trade partner, trade flows with this partner should, ceteris paribus, decrease less for products with high switching costs.*

This prediction echoes the findings of the growing recent literature studying the propagation of shocks in supply chains, Boehm et al. (2015) and Barrot and Sauvagnat (2016) among others focus on natural disasters. The latter show that firms' sales growth and stock prices significantly drop only when a major natural disaster hit one of their specific suppliers. Specific suppliers are those for which it is hard to find an alternative, and hence switching costs are high.

Before testing these predictions in section 4 in a reduced form setting, we introduce the measure of dependence, which we use to identify critical products.

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 2 and constructed using data from input-output

tables. Following equation (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

$$\text{dependence}_j = A_m(I - A_d)^{-1}F \tag{4}$$

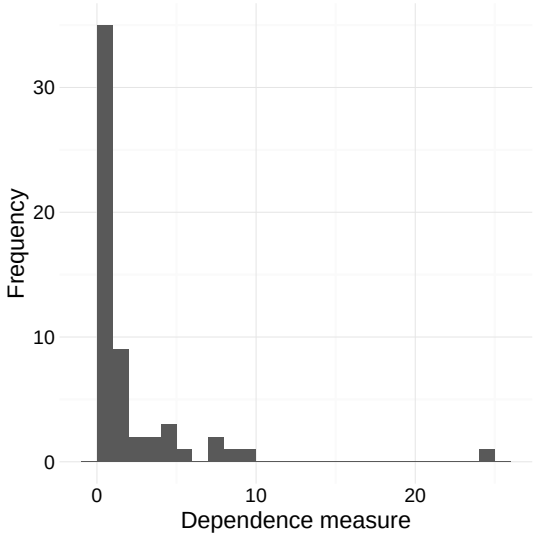
where A_m is the matrix of the values of *imported* inputs by sector and A_d the matrix of the values of *domestic* inputs by sector. F is the vector of final consumption shares. The interpretation of the vector is straight forward: each element denotes the required value of foreign input of the respective 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 "import 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 5. 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 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

[7] See e.g. Johnson and Noguera (2012).

[8] GTAP 8 data are for the year 2007. It ensures the exogeneity of the input coefficients for the event study.



(a) Histogram of dependence for USA

	GTAP Industry	Dependence
1	Petroleum & Coke	24.88
2	Plant Fibres	9.26
3	Chemical Rubber Products	8.90
4	Motor Motor vehicles and parts	7.67
5	Water	7.28
6	Wearing Apparel	5.76
7	Water transport	4.81
8	Raw milk	4.48
9	Paddy Rice	4.11
10	Electronic Equipment	3.77

(b) Top 10 US critical industries

Figure 2: Histogram of dependence measure and top 10 US critical industries (Imported value by industry per 1000 USD GDP)

129 regions, and the tables are globally consistent and cleaned of irregularities. Figure 2a shows the histogram and table 2b 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 5 shows consistent figures by ranking and magnitude across different levels of aggregation of the used input-output tables.

4 Event Study

Having computed the measure of dependence by country and industry, we now test the prediction of the model from section 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.

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

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

by

$$X_{odkt} = \frac{Y_{okt}}{\Omega_{okt}} \cdot \frac{X_{dkt}}{\Phi_{dtk}} \cdot \tau_{odkt} \tag{5}$$

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_{dkt} 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

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

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.

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 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 tries, 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]

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 6 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 1

[10]For 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 *The Guardian*, 24 June 2015, `http://www.theguardian.com/world/2015/jun/24/francois-hollande-says-us-spying-on-french-officials-unacceptable-nsa`.

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

[12]Appendix B.1 lists the direct weblinks to the different websites.

[13]Notably 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

$diff = mean(0) - mean(1)$ $t = -1.91$
$Ho : diff = 0$ degrees of freedom $= 502$

$Ha : diff < 0$ $Ha : diff \neq 0$ $Ho : diff < 0$
$Pr(T < t) = 0.0278$ $Pr(|T| > |t|) = 0.0557$ $Pr(T > t) = 0.9722$

Table 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

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Probit Test for exogeneity

show that country pairs with an event trade significantly more than other country pairs. This rejects the hypothesis that our five importers are less 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. See Table 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.

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

[14]It 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).

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.[15] 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.

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.[16] 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 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 the logarithm our measure of dependence. We normalize the dependence measure by the respective country's average dependence to make the interpretation straight forward. The coefficient on the *Treatment* variable is the average effect for the average dependence import.[17] The coefficient on the $log(Dependence)$ variable then shows the average elasticity of the imports to the dependence measure. We estimate equation (5) as

$$\begin{aligned}\log(X_{odkt}) = F_{okt} + F_{dkt} + F_{odkm} + \delta_0 \cdot \text{Treatment}_{odt} \\ + \delta_1 \cdot \text{Treatment}_{odt} \times \log(\text{Dependence}_{dk}) + \epsilon_{odkt}\end{aligned} \tag{6}$$

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 country pair-specific 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,

[15] In some specifications we restrict the sample to the top 50 exporting economies, as monthly trade with small countries tends to be very granular. As seen below, this does not effect the overall results.

[16] As 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.

[17] As the logarithm of a country's mean dependence is $log(1) = 0$. The normalizations of the dependence measure has no effect on the results.

	Dependent variable:				
	log(imports)				
	(1)	(2)	(3)	(4)	(5)
Treatment	−0.019	−0.016	−0.035*	−0.036	−0.021
	(0.019)	(0.028)	(0.021)	(0.025)	(0.028)
Treatment x log(Dependence)	−0.019***	−0.011	−0.024***	−0.022**	−0.022*
	(0.007)	(0.011)	(0.007)	(0.011)	(0.012)
Fixed effects	ctry-dt,ctry-ind, pair-ind	ctry-ind-dt, pair-ind-mo	ctry-dt,ctry-ind, pair-ind	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 × importer × month × industry. Significance levels: *: p<0.1, **: p<0.05, ***: p<0.01.

Table 3: Event study - Political shock and heterogeneous effect by dependence

and even more so for critical products. Note that δ_0 reflects the *average* impact, i.e. the change in imports following the shock for a good with the respective country's average dependence value, whereas the δ_1 denotes the elasticity, i.e. the percentage change in the impact relative to a percentage change in the depth.

To test prediction 2, the effect of switching costs on the response, we additionally interact both terms with an indicator for high market concentration. After a negative shock to political relations with a trade partner, ceteris paribus, trade flows should decrease less for products with high switching costs. We take the market concentration—computed as the Herfindahl index of exports by industry over countires—as a proxy for the switching cost and dichotomize at the median. In a market with a high concentration of exporters, switching to another supplier may be more difficult (and hence observed less frequently).

4.4 Results

The results for prediction 1 are presented in table 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 × industry × date and country pair × industry × month fixed effects (as opposed to country × date, country × industry and country pair × industry × month fixed effects). It is likely due to the composition of countries that includes numerous small countries and territories whose (monthly) exports in different industries are very granular. In turn, this leads to the fixed effects purging most of the variation. This suspicion is supported by results of estimating equation (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 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.[18] 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 (6) on only non-Arab league countries. We find that this concern is not merited, yielding almost identical results (column 5).

In terms of magnitude, the results are consistent throughout all specifications. The average drop in imports in reaction to a shock to political relations for the average-dependence industry ranges between $exp(-0.016) - 1 = 1.59\%$ and 3.54%. Similarly, the interaction of the treatment variable with the dependence measure yields sensible results. As an example, a one-standard deviation increase in the (log normalized) dependence (2.12) would yield a total effect of up to 8.23%. The magnitude of the effects mirrors well the results from related literature.[19] 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 a measure of political relations from Hinz (2014). The results confirm the outcome of the event study (see appendix C).

The results for prediction 2 are presented in table 4. The coefficients are directly comparable to the results of table 3, as the effects displayed are the total effects. Columns (1) and (2) report the coefficients for the two sets of fixed effects described before. It becomes clear that the effects observed above are very much driven by markets with low switching costs. The average effect for markets with high concentration—and thus high switching costs—is near zero in both specifications, whereas the effect in markets with low concentration is almost twice as high as before. The coefficient on the interaction with the logarithm of normalized dependence is not statistically different compared to before.

The econometric results underline the heterogeneous response of industries to political

[18] See appendix B.2 for the list of events.

[19] As noted above, Michaels and Zhi (2010) find a 8 % drop in bilateral trade between France and the US in response to the Iraq war, while Nitsch (2007) reports an increase of 8–10 in exports after the visit of a head of state.

	Dependent variable:	
	log(imports)	
	(1)	(2)
Low Conc. x Treatment	-0.059^{**}	-0.063^{*}
	(0.028)	(0.036)
High Conc. x Treatment	-0.009	-0.006
	(0.023)	(0.031)
Low Conc. x Treatment x log(Dependence)	-0.028^{**}	-0.024^{*}
	(0.011)	(0.012)
High Conc. x Treatment x log(Dependence)	-0.019^{**}	-0.020
	(0.009)	(0.013)
Fixed effects	ctry-dt,ctry-ind, pair-ind	ctry-ind-dt, pair-ind-mo
Observations	252,321	252,321
R^2	0.904	0.967
Adjusted R^2	0.900	0.913

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

Table 4: Event study - Impact of switching costs

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 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. This effect is conditional on the switching costs, as high costs to change the supplier would mute the response to a political shock. 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.

5 Conclusion

In this paper 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.

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A 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 5: Top 25 US critical industries with BEA Input-Output table

B Press releases from Ministries of Foreign Affairs

B.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`

B.2 List of events

Table 6: 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 diplomate 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
04/03/2011	Germany	Taiwan	summon Ambassador	executions

Table 6 — *Continued on next page*

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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	voilence and attacks on embassies
13/07/2011	UK	Syria	summon Ambassador	ensure Syrian Ambassador protects diplomatic mission
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

Table 6 — *Continued on next page*

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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 Ambassy(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
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

Table 6 — *Continued on next page*

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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
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

Table 6 — *Continued on next page*

Table 6 — *Continued from previous page*

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
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

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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
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

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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
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 vehicules 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 Robustness: Gravity estimation

	Dependent variable:			
	log(imports)			
	(1)	(2)	(3)	(4)
log(pol_relations)	0.377***	0.081***	0.392***	0.054***
	(0.013)	(0.009)	(0.008)	(0.007)
log(dependence)	0.059***	0.066***		
	(0.008)	(0.008)		
log(pol_relations):log(dependence)	0.009***	0.010***	0.005***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
log(distance)	−1.020***		−1.196***	
	(0.021)		(0.008)	
rta	0.461***	0.069***	0.507***	0.065***
	(0.035)	(0.018)	(0.013)	(0.012)
comcur	−0.079	0.304***	0.015	0.305***
	(0.056)	(0.051)	(0.023)	(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 × importer × industry level. Significance levels: *p<0.1; **p<0.05; ***p<0.01

Table 7: 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 Hinz (2014). See the appendix of Hinz (2014) 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 Hinz (2016).

Table 7 shows the results for estimating equation (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 × year, exporter × year and industry fixed effects. As noted, this result is robust to country × pair fixed effects (column 2). This suggest 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 ×

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.