The Effects of Political Institutions on the Extensive and Intensive Margins of Trade*

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Abstract

We present a model of political networks that integrates both the choice of trade partners (the extensive margin) and trade volumes (the intensive margin). Our model predicts that regimes secure in their survival, including democracies but also some consolidated authoritarian regimes, will trade more on the extensive margin than vulnerable autocracies, which will block trade in products that would expand interpersonal contact among their citizens. We then apply a two-stage Bayesian LASSO estimator to detailed measures of institutional features and highly disaggregated product-level data encompassing 131 countries over a half century. Consistent with our model, we find that (a) political institutions matter for the extensive margin of trade, but not on the intensive margin and (b) the effects of political institutions on the extensive margin of trade vary across products falling most heavily on goods whose marketing involves extensive interpersonal contact.

Key Words: extensive and intensive margins of trade, differentiated products, polity, democracy, international trade, variable selection, LASSO

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1 Introduction

Countries’ engagement with international trade includes both their choice of trading partners; the extensive margin\(^1\) and the intensity with which they and their trading partners transact; the intensive margin. Any evaluation of the impact of political institutions on trade must consider their effects on both margins. On the extensive margin, democracies are more likely to trade with one another (Bliss and Russett 1998), and countries with stable domestic property rights and contractual institutions are more likely to trade products with “relation-specific” inputs (Levchenko 2007; Nunn and Trefler 2014). On the intensive margin, some have argued that legislative constraints allow an executive to make a credible commitment to liberalization and mutual reduction in trade barriers (Mansfield, Milner, and Rosendorff 2000, 2002), while democracy favors the owners of domestically abundant factors (Milner and Kubota 2005). In contrast, others argue that the large number of veto players and greater fragmentation of political authority in democracies make them more responsive than autocracies to protectionist demands (Frieden and Rogowski 1996; Henisz 2000; Henisz and Mansfield 2006; Mansfield, Milner, and Pevehouse 2007), raising tariffs and erecting non-tariff barriers to protect domestic interests (Kono 2006, 2008; Tavares 2008).

Yet there are few studies that simultaneously consider both the extensive and intensive margins when evaluating the effects of political institutions on international trade. The “gravity” model of international trade focuses exclusively on bilateral trade volumes, i.e., the intensive margin. Even when the distinction between the extensive and intensive margins is made explicit (Chaney 2008; Helpman, Melitz, and Rubinstein 2008; Manova 2013), the lack of attention to political determinants of international trade on the two margins pervades economic models ranging from the “old” to the “new” trade theories (Arkolakis, Costinot, and Rodríguez-Clare 2012). Indeed, the vast majority of empirical studies of bilateral trade in international political economy examine institutional effects on trade excluding country pairs that do not trade (e.g., Mansfield, Milner, and Rosendorff 2000; Tomz, Goldstein, and Rivers 2007), a practice that opens the door to selection bias in the analysis of the intensive margin.\(^2\)

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\(^1\)Alternatively, extensive margin can be defined as the number of traded products or the number of firms that trade if researchers conduct country-level analysis. Our definition follows from product-level analysis in line with Broda and Weinstein 2006.

\(^2\)See Dutt, Milov, and Van Zandt 2013 who find that WTO membership impacts trade “almost exclusively”
A central contribution of this paper is to develop a theoretical framework that encompasses both the extensive and intensive margins of trade. In our game theoretic network model, autocrats face a dictator’s dilemma (Kedzie 1997). On the one hand, opening their country to trade generates economic benefits. On the other hand, these pecuniary gains come at a political cost: trade entails increased cross-border interactions and communication among the citizenry (Chaney 2014), potentially facilitating rebellion (Erickson 1981; Russett and Oneal 2000). However, once the connections are made, the dictator seeks to extract their full benefit. Hence our model predicts that political calculations will affect extensive margin of trade, but not the intensive margin. It also shows that the government’s ambivalence toward trade stems from the threat of being overthrown, and therefore the political influences on extensive margin trade hinge upon regime security rather than on democracy per se (Egorov, Guriev, and Sonin 2009; Hollyer, Rosendorff, and Vreeland 2011; Lorentzen 2014; Shadmehr and Bernhardt 2015).

To assess our predictions, we analyze an extensive data set, encompassing fine-grained annual dyad level trade data for 131 countries, covering a time span of 51 years on 449 SITC (Standard International Trade Classification) 4-digit products. Including directed dyads with no trade, we analyze about 390 million observations of product-level trade. Our covariates include standard elements of the canonical “gravity” model of trade, plus a battery of institutional variables, and a disaggregated set of Polity IV component variables (Gurr, Marshall, and Jaggers 2010). We capture the density of the networks inherent to trade in various goods using the tripartite taxonomy developed by Rauch (1999). Furthermore, by working with data disaggregated to the four digit product level, we do not rely on the common assumption that demand elasticities and political effects are the same across products, an entailment of analyzing dyadic trade flows aggregated across all products.

Our estimator encompasses both margins of trade using a sparse Bayesian version of the “type-two Tobit model” (Amemiya 1984). Our sparse estimator is designed to cope with the high levels of collinearity endemic to empirical studies in international political economy. Indeed, numerous factors that might affect bilateral trade flows are also correlated with political institutions and with each other. A partial list includes economic size (Tinbergen et al. 1962); preferential trading blocks

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3 An example of a four digit product is SITC 6532: “fabrics, woven, of synthetic staple fibers, containing 85% or more by weight of such fibers (other than chenille fabrics).”
Our empirical analysis yields several results consistent with our theory. First, we show that political variables affect the existence of trade at the extensive margin, but do not impact trade flows in the intensive margin. Second, we find political variables have a greater impact on products whose trade entails more extensive interpersonal contact. Third, we show that unpacking the widely used portmanteau Polity IV measure into its component parts significantly improves the fit of the proposed estimator to the data. This is because only some polity components impact trade, while regime security also accounts for significant variation in the extensive margin of trade. Finally, our analysis also highlights the importance of working with fine grained product data, as the effects of our explanatory variables show remarkable variation across product categories.

The paper progresses in three parts. In the next section, we present our formal model. Section 3 describes our data and methodology. We present our empirical findings in Section 4, and the final section concludes. The bilateral product-level trade dataset, all the estimates for each product and their posterior distributions will be made publicly available.

2 Modeling Political Institutions and the Margins of Trade

We present a network model that isolates the effects of political institutions on the two margins of trade. Motivated by stylized facts in the literature (Section 2.1), we present a network model relating domestic market structure to political networks (Section 2.2). Finally, we characterize equilibrium behavior on the extensive margin (Section 2.3) and intensive margin (Section 2.4).

2.1 Motivation

Our model is motivated by three consistent empirical findings in the literature. First, the vast majority of countries do not even trade in a given product, highlighting the centrality of the extensive margin. Second, among dyads that do trade, there is significant heterogeneity across
Figure 1: **Distribution of Dyads Based on the Direction of Trades:** This figure demonstrates the prevalence of zero trade in SITC 4-digit data across 131 countries. On average, more than 80% of dyads do not trade.

products. Third, for many goods, networks of interpersonal contacts are crucial to facilitating trade.

A striking feature of the trade data is the prevalence of zero trade flows. More than half of country pairs do not engage in any trade at all (Helpman, Melitz, and Rubinstein, 2008), and among trading partners most products are not traded. Figure 1 shows just how prominent zero trade is at the product-level.4 We group each country pair for a given product into three categories: (1) each country exports the product to the other, (2) only one country exports to the other, and (3) neither country in the dyad exports the given product to its partner. Despite the trend of increasing numbers of trading partners, in no year does the fraction of actively trading product-specific dyads exceed 20%. Most dyadic trade that does take place is unidirectional.

Pervasive product level heterogeneity (Schott, 2004; Eaton, Kortum, and Kramarz, 2011) constitutes a second key feature of the data on international trade: Goods differ in demand elasticities, transportation costs, and the concentration of production and demand. Moreover, the relative simplicity of trade in primary products stands in stark contrast with the complex global production networks that characterize commerce in manufactured goods (Antrás et al., 2012; Antrás, 2015).

4We use the fine-grained SITC 4-digit product level, as described in Section 3.1 below.
A third key feature of cross border commerce is its dependence on networks of personal contacts (Rauch 1999; Garmendia et al. 2012). Specifically, networks of informal contacts convey information about trading opportunities, market structure, and previous violations of trade-related contracts; information that makes it possible for producers to overcome trade barriers (Greif 1989; Greif, Milgrom, and Weingast 1994; Nunn 2007). Moreover, the system of informal contacts has various spillover effects such as transfers of technology and learning through increased interaction (Pavcnik 2002; Blalock and Gertler 2004). As noted by Rauch and Trindade (2002, p.116), actors engaged in international trade will serve as “nodes for information exchange.”

These information transfers do not take place in a political vacuum. Transparency and free communication constitute one of the most important dimensions that distinguish various political institutions (e.g., Hollyer, Rosendorff, and Vreeland 2011; Lorentzen 2014). Russett and Oneal (2000) note that trade exposes citizens to the ideas and perspectives of foreign citizens. Moreover, trade networks facilitate direct contact, which is important for the formation of anti-government conspiracies (Erickson 1981). Metternich et al. (2013) highlight the importance of network structures in the emergence of violence, while Larson and Lewis (2018) find that rebel groups can re-purpose co-ethnic networks.

2.2 The Model

Our model encompasses two regime archetypes: an “open” society and an “autocratic” society. In the open society, each individual is free to communicate and exchange with anyone else, whereas for the autocratic society, all communication and trade must pass through the autocrat. The autocrat’s power comes at a price: the people he exploits can, at some cost to themselves, rebel against his exactions.

Networks and Insurrection. We begin by illustrating the workings of our model with Figure 2. Communication links are represented by solid lines. The lefthand side depicts an autocracy: actors are arranged in a “star-shaped” network structure with the dictator, d, in the middle and the three citizens, a, b, and c, connected to the dictator but disconnected from each other. This represents the autocrat having inserted himself into society, saturating the environment with spies, informants, and police so that no communication is secure from the possibility of being reported to the authorities. In this setting, potential rebels are unable to communicate confidentially with
each other as the autocrat has effective control of political contacts (e.g., King, Pan, and Roberts, 2013). The righthand side of Figure 2 portrays an open society with three citizens, A, B, and C, each pair of whom is directly connected by a solid line, communicating without being monitored by a third party.

Suppose that a society of \( n \) individuals is divided into \( T \) components, where all individuals in a particular component are connected by a series of links that exclude the autocrat’s node, while no such connection exists between two individuals in distinct components (Jackson, 2010). We index the components by \( t \in \{1, ..., T\} \), with a fraction \( s_t \) individuals in the \( t \)th component. We measure interconnectivity with the parameter \( \theta \), which calibrates the extent to which society is interlaced with networks that bypass the autocrat:

\[
\theta = \sum_{t=1}^{T} s_t^2. \tag{1}
\]

In the extreme, if society is fragmented into a star network, with each individual isolated in her own component, the network has \( n \) components, with \( s_t = \frac{1}{n} \) each, so that \( \theta = \frac{1}{n} \). At

\[5\]This coincides with the index of concentration propounded by Herfindahl (1950).
the other extreme, if all of society is joined into a single component as in a free society, then \( \theta = 1 \). Intermediate levels of interconnectivity correspond to indices on the interval \((\frac{1}{n}, 1)\), with higher values corresponding to greater interconnectivity. For the autocracy on the lefthand side of Figure 2, \( \theta = \frac{1}{3} \), while for the open society on the right, \( \theta = 1 \).

Rebels are more effective when they are joined in a shared network, and also when the monitoring technologies (e.g., secret police) are inefficient. We thus model the probability of success as given by what we might call the Tullock-Rousseau contest function \( (\text{Hirschleifer, 1989; Skaperdas, 1996; Rousseau, 1963}) \):

\[
\Pr (\text{Rebel Success}) = \frac{\rho \theta}{1 + \rho \theta},
\]

where \( \theta > 0 \) is the networking measure given in expression (1), while \( \rho > 0 \) is an inverse measure of the effectiveness of the autocrat’s security apparatus. Consulting equation (2), we see that \( \Pr (\text{Rebel Success}) \) is increasing in both \( \theta \) and \( \rho \).

The logic of our model can be described by Jean-Jacques Rousseau’s characterization that in a maximally fragmented society, with \( \theta = \frac{1}{n} \), the effectiveness of rebels “evaporates and is lost as they become spread out like the effect of gunpowder scattered on the ground, that only ignites grain by grain” \( (\text{Rousseau, 1963, Livre 3, Chapitre 8}) \). Alternatively, in a maximally connected society, with \( \theta = 1 \), the tangle of network contacts is dense, and the organizers of a rebellion are free to deliberate “as secure in their rooms as the prince in his council, and the crowd assembles as quickly in the public square as the troops in their barracks” \( (\text{Livre 3, Chapitre 8}) \). While Rousseau’s remarks focused on the effects of population density, he provides an apposite description of the importance of a densely connected network for any insurrection.

**Political Spillover Effects of International Trade.** A key element of our framework is the impact of trade on the interconnectivity of the citizens. Suppose that the autocrat chooses to allow trade with the foreign country and that the trading partner has an open society, with no autocrat.

\[
6 \quad \frac{\partial}{\partial \theta} \Pr (\text{Rebel Success}) = \frac{\rho}{(1 + \rho \theta)^2} > 0 \quad \text{and} \quad \frac{\partial}{\partial \rho} \Pr (\text{Rebel Success}) = \frac{\theta}{(1 + \rho \theta)^2} > 0
\]

\( \text{“s’évapore et se perd en s’étendant, comme l’effet de la poudre épars sur le sol, et qui ne prend feu que grain à grain”} \)

\( \text{“sûrement dans leurs chambres que le prince dans son conseil, et la foule s’assemble aussitôt dans les places que les troupes dans leurs quartiers.”} \)
of its own. As illustrated by the red dashed lines in Figure 2, when the two countries exchange goods the process of trade puts citizen b in contact with foreign national B, while citizen c is linked with foreign citizen C. The size of the network of potential rebels remains \( n = 3 \). However, because B and C are linked, there is now a pathway of ties connecting citizens b and c, passing from b to B to C and on to c, a pathway that does not pass through node d. Opening to trade makes the network less legible to the autocrat, allowing citizens b and c to communicate with each other without being “overheard” causing \( \theta \) to rise from \( \frac{1}{3} \) to \( \frac{5}{9} \), and consequently increasing the probability that a rebellion would succeed if it was attempted.

We noted in the introduction the ample evidence personal contacts play an important roll in cross border trade. Given the threat posed by trade-induced interpersonal contact, despots’ ambivalence toward international commerce is unsurprising. For example, North Korea not only monitored communication between southern managers and northern workers in the (now closed) Kaesong Industrial complex, it also spied on its own workers and their friends (Manyin, 2012). Likewise, the former Soviet union not only restricted international telephone connections, it even limited the publication of telephone directories (Pool, 1983), an economically costly move. To this day, “relationship specific” exports are hamstrung by the Russian Federation’s extensive insistence on visas (Kapelko and Volchkova, 2013).

Note that the spillovers in our model bear some resemblance to what De Mesquita and Downs (2005) call “coordination goods” in that they facilitate contact among individuals. However, coordination goods are “public goods that critically affect the ability of political opponents to coordinate but that have relatively little impact on economic growth,” whereas our spillovers pertain to privately transacted goods whose exclusion from trade would be economically costly.

As we noted in Section 2.1, the political spillover effects may differ in degree depending on the type of products being traded (Rauch, 1999). To illustrate this, we represent the added network

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9 In principle, WTO members cannot ‘pick and choose’ among trading partners as they are constrained by the rules of “non-discrimination.” However, our dyad-level analysis is motivated by targeted use of various tariff and non-tariff barriers that countries employ (e.g., Bown, 2011). Furthermore, even within the WTO, negotiators focus on a series of bilateral negotiations based on the “principal supplier rule” on specific products resulting in a 22,500-page document listing the commitments of each country with its partners on specific goods.

10 The connection shrinks the number of components \( t \) from 3 to 2. Individual a is still isolated in her own component, with \( s_a = \frac{1}{3} \), but citizens b and c now share a common component with \( s_{bc} = \frac{2}{3} \), so we now have \( \theta = \frac{5}{9} \) if the autocracy opens to trade.
density implied by trade in differentiated products with the blue dotted line in Figure 2, which connects citizen a with foreign national A. While a potential rebellion can still draw only on the three individuals a, b, and c, these individuals now form a single component, with each individual able to communicate with either of the others while bypassing the autocrat’s node at d, so that $\theta = 1$.[11]

**The Market Structure and International Trade.** Next, we formally examine the decision to trade (extensive margin) as well as the trade volume conditional on trading (intensive margin) for the case of a small economy[12] (hereafter the “home country”) endowed with two goods, $g \in \{D, F\}$. The home country has $n$ citizens, $n_D$ of whom are endowed with one unit of the home country’s abundant good D and with no units of good F, while the remaining $n_F = n - n_D$ citizens are endowed with one unit of good F and no units of good D. We use good D as the numeraire good. The heterogeneous endowments of the citizens imply domestic exchange of the two goods even if there is no foreign trade. In the context of a star network, the domestic traders are able to engage in commerce, though they do so under the watchful eye of the autocrat.

Individuals have constant elasticity of substitution (CES) utility of the form commonly employed in the trade literature (e.g., Melitz, 2003):

$$U(q_D, q_F) = \left( \frac{q_D^{\sigma-1}}{q_D^\sigma} + \frac{q_F^{\sigma-1}}{q_F^\sigma} \right)^{\frac{\sigma}{\sigma-1}},$$  \hspace{1cm} (3)

where $q_D$ and $q_F$ denote the consumption of the goods D and F respectively. Note that $\sigma > 1$ is the elasticity of substitution between the two goods.[13]

Consumption will depend on $p$; the relative price of good F compared to the numeraire good D, and on the value of the individual’s endowment $I$. Under autarky, the domestic price for good F will be[14]

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[11] a and b can communicate using A and B as intermediaries, a can communicate with c with the intermediation of A and C, while b and c are linked through a pathway that accesses nodes B and C.

[12] We use the term “small economy” to mean that the country’s volume of trade has a negligible impact on world prices.

[13] Individuals prefer to diversify their consumption for values of $\sigma$ close to 1 whereas products become better and better substitutes as $\sigma$ increases.

\[ p_{\text{autarky}} = \left( \frac{n_F}{n_D} \right)^{\frac{1}{\sigma}} , \]  

whereas if the home country opens to trade the cheaper world price for good \( F \) prevails:

\[ p_{\text{trade}} < p_{\text{autarky}}. \]  

Absent transfers, opening to trade will benefit individuals whose sole endowment consists of a unit of the domestically plentiful good \( D \), while it will hurt their counterparts endowed only with the domestically scarce good \( F \). To keep track of how prices and income affect welfare, it is useful to formulate the “indirect utility function”:

\[ \psi(p, I) \equiv U(q_D(p, I), q_F(p, I)). \]  

Not only do the incomes of individuals vary with the price of good \( F \), so too do aggregate income \( I(p) \) and average income \( \bar{I}(p) \):

\[ I(p) = n_D + n_F \cdot p \quad \text{and} \quad \bar{I}(p) = \frac{n_D + n_F \cdot p}{n_D + n_F}. \]  

If the economy opens to trade, the gains from the reduced price of the relatively scarce good are sufficient to allow the winners from trade to compensate the losers, leaving everyone better off under trade than with autarky (see, Lemma 2 in the Appendix).

### 2.3 The Decision to Trade: The Extensive Margin

Now suppose that the decision whether to trade, and how to allocate resources, is made by an autocrat who lives in the shadow of potential rebellion. We use a game to illustrate the process at work.

The sequence of events is as follows. First, the autocrat \( d \) decides whether to open or block trade, affecting the extensive margin of trade. If he chooses to trade, the network and price parameters are \( (\theta^{\text{trade}}, p^{\text{trade}}) \), while if he instead opts for autarky the parameters are \( (\theta^{\text{autarky}}, p^{\text{autarky}}) \). The ensuing decisions are depicted in Figure 3. At the top node, the autocrat \( d \) reallocated citizens’ endowments, confiscating all output, then transferring \( A_i \) to each individual \( i \). Next, before the bundles get consumed, “Nature” (N) randomly selects a representative citizen \( j \) who has an
Figure 3: The Extensive Margin of Trade: The figure summarizes the subgame in which the autocrat $d$ makes a decision to trade anticipating its network spillover effects. The payoffs in the terminal nodes are for a representative subject $j$ and the autocrat $d$, respectively.

opportunity to lead a rebellion. This represents the inherent unpredictability of rebellions. If she chooses to “Acquiesce” rather than “Rebel”, she garners the allocation $A_j$ already assigned to her by the autocrat before she was selected by nature. This renders her a utility of $\psi(p, A_j)$. Other individuals $i$ receive utility of $\psi(p, A_i)$, while the autocrat consumes everything that was not shared with citizens, gleaning a utility level of $\psi(p, I(p) - \sum A_i)$. If instead the citizen opts for rebellion, only a fraction $\omega \in [0, \frac{1}{2}]$ of each endowment survives the conflict.\(^{15}\) With probability $\frac{\rho \theta}{1+\rho \theta}$, the rebellion succeeds (see expression (2)), ousting the autocrat, who gets a payoff of 0, and all citizens share equally in the surviving surplus. Should the rebellion fail, the autocrat seizes all available resources, while the citizens get nothing.

\(^{15}\)This condition on $\omega$ means the rebellion is very destructive.
Figure 4: The Expansion of the Extensive Margin of Trade: This figure illustrates that $\theta^*(p^{\text{trade}})$, the maximum level of network connectivity the dictator would tolerate to trade, is a decreasing function of $p^{\text{trade}}$. The shaded region characterizes the combinations of $p$ and $\theta$ for which the dictator opts not to trade. The blue dashed line describes the range of $\theta$ for which the dictator accepts trade at a price of $p^{\text{trade}}$, the red line shows those at which he demures. The right panel shows that as the efficiency of the secret police increases, so does the size of the “No Trade” region.

Anticipating the random outcome of a potential insurrection, the dictator prefers to appease the public rather than risk rebellion. The autocrat brings citizens to the edge of indifference between rebellion and acquiescence by proffering everyone the same pusillanimous amount, $A^*$, equal to the per capita income available if the rebellion prevails, weighted by the probability the rebels succeed$^{16}$:

$$A^* = \left( \frac{\rho \theta}{1 + \rho \theta} \right) \omega I(p). \quad (8)$$

Working backwards through the game, the autocrat will open to trade provided that the extra threat posed by greater network connectivity does not overshadow the additional rents he is able to capture. We formalize this in terms of the maximum extra network connectivity, $\theta^*(p^{\text{trade}})$, the dictator would tolerate to access a price $p^{\text{trade}}$ instead of facing the autarkic price of $p^{\text{autarky}}$. The connection between this threshold and $p^{\text{trade}}$ is depicted on the lefthand side of Figure 4 where the horizontal axis corresponds to the price for good $F$ that could be accessed by opening to trade,

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$^{16}$See the Appendix for further discussion and a proof.

$^{17}$We leave implicit the dependence of $\theta^*$ on $\theta^{\text{autarky}}$, the connectivity faced by the leader with no trade, and on $p^{\text{autarky}}$, the price under autarky.
while values for \(\theta\), our network parameter, can be found along the vertical axis. At a price of \(p^{\text{trade}}\), the dashed blue line indicates the values for \(\theta^{\text{trade}}\) that would lead the regime to open to trade at a price of \(p^{\text{trade}}\), while the red dashed line corresponds to \(\theta^{\text{trade}}\) levels that would deter the regime from opening. As \(p^{\text{trade}}\) varies, the solid parabola marked \(\theta^*(p)\) traces out the set of \(\theta\) that would leave the regime indifferent between opening to trade and remaining autarkic. For \((p, \theta)\) combinations in the gray shaded region above the curve, the price reduction is not sufficient to tempt the regime to accept the higher \(\theta\) that trade would entail, whereas below and to the left of the solid line, the regime stands ready to accept the extra \(\theta\) in exchange for the more favorable price. Notice that as the trade price approaches \(p^{\text{autarky}}\), \(\theta^*(p^{\text{trade}})\) likewise approaches \(\theta^*(p^{\text{autarky}})\).

We summarize this with Proposition 1.

**Proposition 1 (Regime Security and the Extensive Margin of Trade)** The maximum degree of network spillovers an authoritarian regime will accept in order to trade, \(\theta^*(p^{\text{trade}})\), is a decreasing function of \(p^{\text{trade}}\).

Proof is in Appendix A1.3.

As an autocrat becomes more effective in controlling political communication, so that \(\rho\) falls and the locus of equilibrium cutoff values shifts upward, making the regime more amenable to trade. The righthand side of Figure 4 shows this mechanism by contrasting \(\theta^*(p^{\text{trade}})\) of a vulnerable autocrat (dashed parabola), with the with a greater tolerance for connectivity associated with a low value for \(\rho\) (solid parabola).

In an open society network, spillovers become politically irrelevant so that all trading possibilities will be potentially attractive. To be sure, a society that can organize a set of transfers leaving everyone better off as the result of trade might still choose not to trade. However, if an interest group is powerful enough to block trade, it may also enjoy sufficient influence to allow the trade and then compel the winners to compensate.

### 2.4 Trade Volumes: The Intensive Margin of Trade

Now consider the equilibrium trade volume conditional on trade, i.e., the intensive margin. To compare the demand under autarky and free trade, we express net exports of \(x_D\) units of good \(D\) and as the difference between endowments and demand, and likewise for good \(F\):
\[
\left(x_D(p, I(p)), x_F(p, I(p))\right) = \left(n_D - q_D(p, I(p)), n_F - q_F(p, I(p))\right). \tag{9}
\]

Under autarky both of these quantities, are, by definition, equal to zero. If the country opens to trade, the relative price of good \( F \) falls to \( p^{\text{trade}} < p^{\text{autarky}} \), and the country becomes a net exporter of good \( D \) and an importer of good \( F \):

\[
x_D\left(p^{\text{trade}}, I(p^{\text{trade}})\right) > 0 \quad \text{and} \quad x_F\left(p^{\text{trade}}, I(p^{\text{trade}})\right) < 0. \tag{10}
\]

Notice that after a country opens to trade, total imports and exports depend on aggregate income, not on how it is distributed among the public. For a free society, aggregate income is given by: \( I^{\text{free}} = I(p^{\text{trade}}) \) (see expression (7)), and net exports for each good coincide with those given in expression (10).

Next, consider a country ruled by an autocrat who opts to trade. We have seen the autocrat will appease, so there will be no rebellion, hence aggregate income will be the sum of the \( A_i = A^* \) handed out to the citizenry plus the residual endowment of the autocrat:

\[
I^{\text{autocracy}} = \sum_{i'} A_{i'} + \left(I(p^{\text{trade}}) - \sum_{i'} A_{i'}\right)
= \sum_{i'} A^* + \left(I(p^{\text{trade}}) - \sum_{i'} A^*\right)
= (n_D + n_F)A^* + \left(I(p^{\text{trade}}) - (n_D + n_F)A^*\right)
= I(p^{\text{trade}}).
\]

Thus, an open society’s aggregate income with free trade will be identical to aggregate income in a society ruled by an autocrat, should he choose to trade. Consequently, imports and exports will also coincide with those set forth in expression (10) for both regime types, provided of course that they trade at all\(^{18}\).

### 2.5 Empirical Implications of our Theory

Our analysis in Sections 2.3 and 2.4 makes the strong prediction that regime type matters for the extensive margin of trade, but not for the volume of goods being transacted when trade actually

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\(^{18}\)Technically, this result stems from the homotheticity built into the CES preferences that are the mainstay of trade theory.
occurs:

**Hypothesis 1** *Insecure authoritarian regimes will be more reluctant to trade on the extensive margin, whereas conditional on trade taking place at all, regime type will not impact the intensive margin.*

Furthermore, holding \( \theta^*(p_{\text{trade}}) \) fixed, the effects of regime type will be mediated by the network externalities associated with each industry, because the success of rebellion depends on the density of political networks. We operationalize these network effects using the taxonomy of goods developed by Rauch (1999) in which differentiated products entail more extensive interpersonal contact, and so greater information spillovers, than do reference priced articles or exchange traded commodities:

**Hypothesis 2** *Insecure authoritarian regimes will be more reluctant to trade on the extensive margin in differentiated products than they are to traffic in reference priced and exchange traded goods.*

### 3 Data and Methods

We assemble an extensive trade data, including GATT and WTO membership, along with measures of colonial history and military alliances, merged with desegregated Polity data. We construct a Bayesian statistical estimator that accounts for the joint endogeneity of the extensive and intensive margins of trade, and applies a sparse prior to contend with the collinearity endemic to our extensive roster of explanatory variables.

#### 3.1 Data

Differences in production technology and consumers’ tastes imply that even the typical economic factors in the gravity specification of trade, such as distance and size of the economy, can have differential effects on trade flows across dissimilar products on both margins. For example, distance might matter more for industries with high transportation costs, whereas the consequence of the size of the importing country’s market will be magnified for industries with greater increasing returns to scale. Yet most studies of institutional effects on trade implicitly assume homogeneous
effects across products by only considering the total volume of bilateral trade, aggregating across a diverse set of products (e.g., Rose 2004; Goldstein, Rivers, and Tomz 2007).

To minimize compositional bias caused by different countries trading different bundles of goods, we analyze SITC 4-digit product-level trade flows, the most finely disaggregated trade data available that spans our entire 1962-2012 time period\textsuperscript{19} This taxonomy, maintained by the UN, classifies each product based on its market uses, on the materials used in its production, and on the processing phase, adjusting for technological change.

We include countries that have existed as sovereign states during the period, listed in Appendix A5. These nations account for more than 90% of total world trade. Using the concordance table available in the United Nations Statistics Division\textsuperscript{20} we track all 449 unique SITC 4-digit product categories that are comparable across years. This cross-matching addresses the appearance and disappearance of product categories over time, reducing the bias due to the heterogeneity across products in different periods. Finally, we compute the volume of trade for each product, leaving us with a dataset distinguishing imports and exports for each year covering all 449 products and every dyad. Considering all directed dyads, including those without trade to account for the pattern observed in Figure 1 results in \((\frac{131}{2}) \times 2 \times 449 \times 51 = 389,969,970\) observations for our analysis.

**Gravity Variables.** We include a canonical list of dyad level “gravity” variables from Rose (2004) and Goldstein, Rivers, and Tomz (2007), including the log of population for each country, (Importer population, Exporter population), and their logged incomes (Importer GDP, Exporter GDP).\textsuperscript{21} We also include dyad-level covariates: the logged distance between the members of the dyad (Distance), an indicator for a contiguous land border (Land Border), a common language (Common language), a past colonial relationship (Colony), and a common former colonizer (Common Colony).\textsuperscript{22} In order to control for the effects of institutional membership in GATT/WTO, we include indicators for whether both elements of a dyad are formal members of the WTO (Both

\textsuperscript{19}We used the data extraction API available from the UN Comtrade Database to handle the large automatic download volume. Typically, the size of data amounts to more than 150MB for each year.

\textsuperscript{20}The concordance table is available in https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp

\textsuperscript{21}Source: Penn World Tables 7.0.

\textsuperscript{22}Some of these variables, such as Common Colony, might reasonably be considered to proxy political institutions, although they are included in “economic” gravity specifications.
formal members) or participants (Both participants), for whether only one of the countries in a dyad is a formal WTO member (One formal member), or a WTO participant (One participant), and we code for whether each member of a directed dyad is a non-member participant (e.g., Importer Formal member, Exporter Participant). In addition, we include an indicator for an alliance relationship (Alliance) from the Correlates of War Project (Gibler, 2013), to control for security relations among trading partners (Gowa, 1989). Even though this is not an exhaustive list, these variables capture the key economic forces identified in the literature as affecting bilateral trade.

**Unpacking Polity IV** Rather than impose a *portmanteau* measure of democracy, such as the Polity IV variable POLITY\(^{24}\) or one of the alternatives (Przeworski et al., 2000; Czepiel and Reinicke, 1991; Bollen, 1993; House, 2014), we separate POLITY into its six constituent components to capture various aspects of political institutions. The first four variables, Competitiveness of Executive Recruitment, Openness of Executive Recruitment, Constraint on Chief Executive, and Competitiveness of Political Participation, possess natural orders of their own, with lower values generally corresponding to more autocratic institutions, while higher scores are earned by institutions associated with more open societies.\(^\text{25}\) We incorporate two other measures from the Polity IV data set: Regulation of Executive Recruitment, a three-point scale measuring the “regularity” of the current leader’s accession to power; and Regime Durability, operationalized as the length of time the current regime has endured.\(^\text{26}\) We shall see below that these disaggregated measures better capture the impact of institutions on trading relationships than does the POLITY measure alone. Moreover, note that while the Regime Durability variable is related to regime stability, it is by no means synonymous with democracy.

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\(^{23}\) The reader will notice that our formal and participant membership variables are perfectly collinear, rather than arbitrarily dropping one, we follow the standard approach for sparse estimators by allowing our LASSO estimator to deal with them.

\(^{24}\) The weights used to aggregate this measure from its component parts exhibit a degree of arbitrariness, see Table A1 in Appendix A4.

\(^{25}\) For more detail on each sub scale, see Gurr, Marshall, and Jaggers (2010).

\(^{26}\) We exclude the Polity IV variable meant to capture the extent to which political participation is “regulated,” because it is not a monotonic scale.
3.2 The Methodology: Bayesian Two-Stage Selection Specification

Our specification requires estimating two interlocking processes. First, there is the extensive margin, the binary choice of whether to engage in trade. We use a probit specification for this outcome. Second, on the intensive margin we implement a Type II Tobit specification to counteract the bias that would otherwise emerge were we to ignore the dependence of the second margin on the first.

3.2.1 The Covariates and Outcomes

We consider two outcomes, one for each margin. On the extensive margin, the binary variable $\delta_{ijtk}$ takes on a value of 1 if country $i$ imports good $k$ from country $j$ at time $t$, else it equals 0. For the intensive margin $\tilde{Y}_{ijtk}$ is the value of imports of $k$ to $i$ from $j$ at time $t$. We will work with the more tractable log-transformed outcome $Y_{ijtk} = \log(1 + \tilde{Y}_{ijtk})$.

We let $x_{ijtk}$ denote the observed covariates, which we decompose into a vector of gravity variables $x_{ijtk,G}$, augmented with an intercept, and another consisting of Polity variables $x_{ijtk,P}$:

$$x_{ijtk} = [x_{ijtk,G}^\top : x_{ijtk,P}^\top]^\top.$$

Estimating the Extensive Margin We use a probit specification at the extensive margin for each product $k$, comparing two versions: $\mathcal{E}_k^P$, which includes gravity and political variables, and $\mathcal{E}_k^G$, which is identical with the first, save that it excludes the political variables:

$$\mathcal{E}_k^P : Pr(\delta_{ijtk} = 1 | \cdot) = \Phi(x_{ijtk,G}^\top \beta_{k,G} + x_{ijtk,P}^\top \beta_{k,P} + b_{ik} + c_{jk} + d_{tk})$$

$$\mathcal{E}_k^G : Pr(\delta_{ijtk} = 1 | \cdot) = \Phi(x_{ijtk,G}^\top \beta_{k,G} + b_{ik} + c_{jk} + d_{tk})$$

where $\{b_{ik}, c_{jk}, d_{tk}\}$ are importer, exporter, and time random effects, respectively,\footnote{The random effects account for “multilateral resistance”} while $\Phi(z)$ denotes the cumulative distribution function of a standard normal random variable. According to Hypothesis 1, which we test below, $\mathcal{E}_k^P$ should receive more support from the data than $\mathcal{E}_k^G$.

\footnote{Liu (2009) advocates Poisson regression over the Tobit, however the trade flow outcome is virtually continuous and our theory predicts heterogeneous zero-inflation, both of which would confound a Poisson specification. Another alternative, the Poisson pseudo-maximum likelihood estimator (Silva and Tenreyro 2006), does not differentiate between the two margins.}
Estimating the Intensive Margin  Here we also consider two specifications for each product \( k \): \( \mathcal{I}_k^P \), which contains both the gravity and political variables, and \( \mathcal{I}_k^G \), with the same structure, save that it excludes the polity variables. For dyads with positive trade flows we have:

\[
\mathcal{I}_k^P : Y_{ijtk} = x_{ijtk,G}^\top \gamma_{k,G} + x_{ijtk,P}^\top \gamma_{k,P} + f_{ik} + g_{jk} + h_{tk} + \lambda_k m_{ijtk}^P + \epsilon_{ijtk}; \quad \epsilon_{ijtk} \sim \mathcal{N}(0, \sigma_k^2) \quad (13)
\]

\[
\mathcal{I}_k^G : Y_{ijtk} = x_{ijtk,G}^\top \gamma_{k,G} + f_{ik} + g_{jk} + h_{tk} + \lambda_k m_{ijtk}^P + \epsilon_{ijtk}; \quad \epsilon_{ijtk} \sim \mathcal{N}(0, \sigma_k^2) \quad (14)
\]

where \( \{f_{ik}, g_{jk}, h_{tk}\} \) are importer, year, and time random effects, respectively. Because we only estimate this specification for dyads that actually trade, our estimator for \( \mathcal{I}_k^P \) contains a bias correction factor, known as the “inverse Mills ratio”\(^{29}\):

\[
E\{\tilde{u}_{ijtk} | \delta_{ijtk} = 1, \mathcal{E}_k^P\} = -\frac{\phi(x_{ijtk,G}^\top \beta_{k,G} + x_{ijtk,P}^\top \beta_{k,P} + f_{ik} + g_{jk} + h_{tk})}{\Phi(x_{ijtk,G}^\top \beta_{k,G} + x_{ijtk,P}^\top \beta_{k,P} + f_{ik} + g_{jk} + h_{tk})} = m_{ijtk}^P \quad (15)
\]

Including \( m_{ijtk}^P \) as an additional covariate protects the intensive margin coefficients from selection bias \(^{29}\)\(^{[29]}\)Heckman (1979) [Olsen (1980)].

Prior Specification.  We are conducting a fine-grained analysis not just in terms of data but in terms of our specification. After including gravity variables, disaggregated Polity IV component variables, and allowing for time-varying effects, we are left with numerous other explanatory variables. In order to estimate and select from this subset, we turn to recent advances in machine learning developed for fitting high-dimensional linear structures [Ratkovic and Tingley, 2017]. We use this variable selection technology in order to estimate parsimonious specifications and select the most relevant explanatory variables.

Our estimator implements a statistical method for “sparse structures,” an approach designed for specifications fraught with a large number of correlated explanatory variables, many of which are likely redundant. The estimator is designed to explain the data well in terms of a small subset of the variables. In our case, we estimate numerous coefficients corresponding with political or economic covariates. Without a sparse estimator, using a \( p \)-value threshold in a likelihood based context, we would expect to encounter many “false positives”—irrelevant variables that the likelihood based approach would highlight as significant. Our Bayesian approach with a sparse prior, in contrast, sidesteps this inferential problem. The approach we use has been found in other contexts to be

\(^{29}\)We calculate this expectation using the full extensive margin specification \( \mathcal{E}_k^P \).
both powerful in identifying true effects and effective at not falsely including spurious effects that are in truth equal to zero (see Ratkovic and Tingley, 2017 for extensive simulation evidence and applications). A full, formal description of our estimator appears in Appendix A2.

Assessing the Fit of our Specification  The Bayes factor is a summary used to select between competing specifications (Gelman et al., 2014, esp. Sec 7.4, Example 1). We use this criterion to compare $\mathcal{E}_K^P$ and $\mathcal{E}_K^G$. Denoting the observed data for good $k$ as $D_k$, the Bayes factor assessing the weight of the evidence in favor of specification $\mathcal{E}_K^P$ over specification $\mathcal{E}_K^G$, and hence in favor of Hypothesis 1, is:

$$
BF^E_k = \frac{Pr(D_k | \mathcal{E}_K^P)}{Pr(D_k | \mathcal{E}_K^G)}.
$$

Analogously, we can compare the competing versions of our intensive margin specification:

$$
BF^I_k = \frac{Pr(D_k | \mathcal{I}_K^P)}{Pr(D_k | \mathcal{I}_K^G)}.
$$

Because we encounter some very large magnitudes, we report logged values of the Bayes factor, so a positive value provides evidence that the version with both gravity and political variables receives more support from the data. Ultimately one’s posteriors depend on one’s priors, but several “rules of thumb” have been suggested; Kass and Raftery (1995) assert that a logged Bayes factor greater than 6 (corresponding to $BF \approx 20$) implies “strong” evidence, while any value above 10 (corresponding to $BF \approx 150$) constitutes “very strong” evidence, see also Jeffreys (1998).

4 Empirical Results

Section 4.1 introduces heatmaps for presenting the outputs from our estimator. In Section 4.2, we provide a complete discussion of our results. Section 4.3 uses Bayes factors to assess the hypotheses generated by our formal model.

4.1 Reading the Heat Maps

We have a massive amount of data. We estimate the extensive and intensive margins of trade separately for each of the 449 SITC 4-digit products, generating thousands of parameter estimates.
Figure 5: **Effects of Logged Distance on the Extensive Margin of Trade:** Pairs of industries are labeled with the smallest effects of distance on trade. The left side of the panel shows the posterior medians (black circles) with 95% credible intervals. The right-hand side is the heat map representation, which corresponds to the first column in Figure 7.
and corresponding credible intervals \( (13, 470 = 449 \times (18+12)) \) to report for each margin. Inspired by genomic studies (e.g., [Eisen et al., 1998]), we display them concisely using a “heat map.”

The products are ordered by SITC 4-digit code, with the first-digit industry groupings on the vertical axis and explanatory variables on the horizontal axis. Coefficients with at least 95% posterior mass below zero are represented by narrow blue bands, while coefficients with more than 95% of posterior mass above zero are colored red. The greater the median of the posterior density, the more darkly shaded the color.

To illustrate, Figure 5 portrays our estimated extensive margin coefficients for one variable, the logged distance. On the left-hand side of the panel, each dot represents the median of the posterior density for each product, while the horizontal lines present 95% credible intervals—thanks to the precision of our estimates, many of these intervals are so narrow they coincide with the medians. On the right-hand side, we color code each coefficient (the heat map representation).

This figure shows that the effect of distance varies by product, though greater distance generally reduces the likelihood of trade. The lack of red stripes confirms that distance never stimulates trade, though for some industries it appears not to matter. The white shaded band of the heatmap corresponding to “Ores and concentrates of uranium and thorium” (SITC 2860) within the “Crude Materials, inedible, except fuels” industry (SITC 2), indicates that the 95% posterior credible interval contains zero. Likewise, “Ammoniacal gas liquors produced in gas purification” (SITC 5213) corresponds with the figure’s other white color band.

Figure 6 zooms in on a row of the heat maps below, displaying the extensive margin coefficients for “Coated or impregnated textile fabrics” (SITC 6554). The 95% credible interval for the exporter GDP coefficient lies well above zero, represented by a dark red band of color, while the posterior mode of the distance coefficient is well below zero, represented by a dark blue streak in the corresponding line of the heat map. The posterior density of the Regulation of Executive Recruitment coefficient for importers is relatively small and positive, thus it is represented on the heat map as a faded pink stripe. The corresponding effect for exporters is small and negative, represented by a washed-out strip of blue color.
4.2 Parameter Estimates

We report our estimates for the impact of the gravity variables and then turn to the estimated impact of regime type on trade.

4.2.1 The Gravity Variables

Figures 7 and 8 display heat maps across all products for the coefficients of the gravity variables on the extensive and intensive margins of trade, respectively. Turning first to Figure 7, the standard gravity variables have their expected effects. Distance impedes trade on the extensive margin, while increased income in either the exporting or the importing country is associated with a greater likelihood that two countries trade a given product. A higher GDP for the exporting country is associated with an even higher likelihood of trade in chemicals and manufactures, indicated by the vivid lines in the top segments of the fifth column. The bright red column corresponding with the Colony variable shows that a former colony/colonizer relationship is trade enhancing. More sporadic and attenuated trade enhancing effects are associated with sharing common language or border, being linked by a defensive alliance, or sharing a former colonial power, each of which has
Figure 7: **Extensive Margin (Gravity Variables):** This figure presents our coefficient estimates for the gravity variables on the extensive margin using the heatmap conventions outlined in Section 4.1.

been identified in the literature.

Our GATT/WTO variables have mixed effects on the extensive margin, though the exporter being a formal member appears to encourage trade in chemicals and manufactures. In contrast, the effects of formal membership on exports of primary products appears to be negative, whereas for the same industries, having participant status is strongly export promoting.

Figure 8 presents results on the intensive margin. Higher incomes are trade promoting for both the exporter and the importer, at least for chemicals and manufactures, though the estimated effects are less pronounced than on the extensive margin. Greater distance impedes trade, while one country being the former colony of the other enhances it, but the magnitudes pale, literally in the context of our heat map, by comparison with the corresponding effects of these variables on the extensive margin.

As for the GATT/WTO measures, the **Exporter Participant** variable sporadically impedes intensive margin trade. This suggests that even industries with low potential trading volumes enter into export trade when a country is a participant. The remaining effects of the intensive margin GATT/WTO variables are severely etiolated. This is consistent with **Dutt, Mihov, and Van Zandt (2013)** who find that the effect of GATT/WTO is driven “almost exclusively” by the extensive margin.
4.2.2 Institutions Promoting Extensive Margin Trade

Several of our institutional variables appear to affect trade on the extensive margin (see Figure 9). In accordance with Hypothesis 1, we observe that the coefficient estimates for Constraint on Chief Executive and Competitiveness of Political Participation are consistent with autocracy (corresponding to low values for these variables) inhibiting exports, while Regime Durability emerges as export promoting. In all three cases, the impact of regime type is more pronounced among manufactured products than it is for primary products. This is consistent with Hypothesis 2 which implies a greater impact of regime type on trade in differentiated products. In fact, we find that these patterns are substantially more prevalent among manufactures. In Section 4.3, we test Hypothesis 2 formally. While our theoretical model does not posit a tendency for exports to involve greater network externalities than imports, the empirical results suggest this may be the case.

Beyond the predictions of our theoretical analysis, two fairly similar components of democracy emerge as having opposite effects on imports across product categories: Openness of Executive Recruitment, corresponding to hereditary autocrats rather than constitutional monarchs, inhibits imports, while Regulation of Executive Recruitment, low values of which correspond with coup-

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32 Applying Rauch’s “liberal” criterion, about 56% of manufactured products (industry groups 5-8) are differentiated goods, whereas only 19% of industry groups 0-4 are found in this category.
prone polities, is associated with an elevated probability of importing, and a lower probability of exporting a given product. Most of the countries in our sample appear at the the same end of both scales, where the effects of these two variables on imports tend to cancel each other out. What remains is the export inhibiting effect we estimate for the Regulation of Executive Recruitment. This appears to be a byproduct of the economic dislocations caused by coups.

4.2.3 Political Institutions and the Intensive Margin

Next, we turn to the intensive margin. Figure 10 shows that the estimated parameters on the polity variables display a drastic attenuation consistent with our Hypothesis 1. The impact of the Constraint on Chief Executive measure disappears almost entirely, while the sporadic and faint red strips corresponding to Competitiveness of Political Participation and Regime Durability are pallid reflections of the corresponding extensive margin coefficients. The executive recruitment coefficients are likewise enfeebled—the faint blue of the remaining Regulation of Executive Recruitment coefficients suggest that perhaps in more stable systems, trade extends to goods with low potential volumes that would not be traded at all in a coup-prone political environment. Below, we evaluate more formally whether this faded collection of parameters is simply the byproduct of an over-parameterized specification.

To gain insight into the selection effects, Figure 11 presents the results for the estimated
Figure 10: **Intensive Margin (Polity Variables):** This figure summarizes the estimated effects of *Polity IV* variables on the intensive margin of trade with the proposed bias correction. It shows sharply attenuated effects of the variables conditional on the extensive margin of trade. The prevalence of white color suggests that political institutions do not matter for most of agricultural products and crude materials on the intensive margin of trade.

The vast majority—over 90%—of the credible intervals are negative and exclude 0 (black lines), providing strong evidence that selection impacts trade. Note that almost all of the significant coefficients are negative. This is in line with the fact that commodities that are actually transacted have above average potential trade volumes relative to the commodities that are not. Of the remaining tenth of cases the credible intervals include zero, providing little evidence either for or against a selection effect.

### 4.3 Regime Type, Spillovers, and the Extensive Margin of Trade

The impact of the inverse Mills ratio (see Figure 11) and the heatmaps of all estimated coefficients consistently show a pronounced impact of political institutions on the extensive, but not intensive, margin. To assess the finding more formally, we utilize Bayes Factors to help select among specifications across each model that we estimate for each product as described in Section 3.

Figure 12 presents the Bayes factors comparing our political and gravity-only specifications.

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33. This is $\lambda_k$ in equations (13) and (14).

34. In equation (37) the residual term $\tilde{u}_{ijkt}$ enters with a negative sign, so a large negative value of $\tilde{u}_{ijkt}$ makes the dyad more likely to trade; the negative values are associated with larger intensive margin trade volumes.

35. These include a handful of products in the ‘machinery and transport equipment’ (SITC 7) group, such as rail locomotives, and various crude materials (SITC 2) such as ‘semi-chemical wood pulp’, 49 products in all.
Figure 11: The Impact of the Inverse Mills Ratio: This figure displays posterior means and 95% credible intervals for the estimated effects of the inverse mills ratios on the intensive margin of trade. We find statistically significant deviation from zero effect (marked by back horizontal line) for most products. This provides formal evidence of selection due to political institutions in the extensive margin of trade.
Figure 12: **Institutional Variables Matter for Extensive Margins**: The box-and-whisker plot in each panel shows the distribution of BF_k for each margin as defined in expressions (16) and (17).

The data universally favor the inclusion of the *Polity* variables at the extensive margin, consistent with Hypothesis 1. In contrast, the right panel of Figure 12 fail to provide systematic support for including political institutions on the intensive margin. The distribution of Bayes factors is centered around and includes zero. This finding suggests that existing studies might overestimate the effect of political institutions on trade volume, the intensive margin, by excluding country pairs that do not trade, *i.e.* disregarding the extensive margin of trade (e.g., Mansfield, Milner, and Rosendorff, 2000).

Finally, we conduct an additional formal analysis of Hypothesis 2 by comparing the distribution of Bayes factors across all products within the three distinct categories of product differentiation (Rauch, 1999). Specifically, we examine whether the distribution of Bayes factors for differentiated products *first order stochastically dominates* that of other products with referenced price and goods traded in organized exchanges (Lehmann, 1955; Hanoch and Levy, 1969). Stochastic dominance is often used to compare the riskiness of lotteries (Hadar and Russell, 1969); here we use it to compare the tendency of one class of goods to generate higher Bayes factors in favor of including political variables. This allows us to evaluate our prediction across the entire range of percentiles in the distribution (see Appendix A3 for further exposition of first order stochastic dominance).

Consulting the left panel of Figure 13, the red line, corresponding to the fraction of Bayes factors among the differentiated products that exceed any threshold, lies above the corresponding lines for the other categories. Similarly, the blue line for reference priced goods also exceeds or equals the line for the products traded on organized exchanges. Support for including our political
Figure 13: **First-order Stochastic Dominance by Differentiated Products:** The vertical axes report the fraction of observations with Bayes factors at or above the value reported on the horizontal axis. We find that the model with political institutions is particularly favored for differentiated products at the extensive margin of trade across.

variables in the specification is stronger for industries that involve greater interpersonal contact, and more extensive exchange of information. In contrast, the analogous curves for the intensive margin show no such tendency, with the interlaced cumulative densities crossing each other at various points. This is consistent with Hypothesis\[4\] which implies political factors will not affect the intensive margin of trade.

5 **Concluding Remarks**

We make several contributions. First, we develop a model of political networks that explicitly distinguishes the effects of political institutions on the extensive and intensive margins of trade.

Our model focuses on the tendency for trade to facilitate communication amongst the people involved in producing and marketing products across borders. For democracies and consolidated authoritarian regimes, this poses little or no threat, but for vulnerable autocracies this communication can spill over into the political realm by allowing regime opponents better to coordinate their activities. Thus vulnerable regimes block cross border commerce on the extensive margin for products with high network spillovers relative to the potential gains from trade that they offer. These spillovers appear to be greatest in differentiated products.

Second, we employ an estimation strategy that simultaneously deals with the selection issue
and the substantial collinearity that emerges from analyzing various features of political institutions. Our estimator, based on the recent development of machine learning techniques in variable selection methods (Ratkovic and Tingley 2017), identifies systemic patterns of international trade using extensive product-level trade data while ensuring compatibility across products over a half century. We merge the trade flows data with a panoply of country and dyad level covariates claimed to affect bilateral trade. To the best of our knowledge, the size, scope, and level of disaggregation in our dataset expands the empirical frontier for the political economy of trade literature.

Our estimates show the impact of our political variables falls primarily on the extensive margin, while the impact of political institutions varies across industries, with their largest effects manifesting among differentiated products. These are products for which we expect the political spillovers resulting from personal contacts to be more important, thereby making vulnerable authoritarian regimes more reluctant to trade. The profile that emerges from our empirical analysis of a regime that promotes extensive margin trade does not coincide with democracy. We do find that some Polity IV components of democracy — Competitiveness of Political Participation and Constraint on Chief Executive — promote extensive margin trade, and that they do so primarily for differentiated products. But this is also the case for Regime Durability, which does not even form a part of the POLITY composite democracy measure. While our theory does not distinguish between the network externalities entailed by exports and imports, our empirical result is that the impact of all three of the aforementioned variables is concentrated on the extensive margin for exports, but not for imports. This is consistent with the exporter of a differentiated product needing to make extensive contacts in the importing country, beyond the watchful gaze of the exporting country’s secret police.

Our finding that the polity variables affect differentiated products on the extensive margin, while they have little systematic effect on the intensive margin, is consistent with our theory, and highlights the importance of interpersonal contact for the effects of regime type on trade. Generating better measures of networks is a high priority for ongoing investigation.
References


