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Trade Openness and Antitrust Law

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Abstract

Openness to international trade and adoption of antitrust laws can both curb anticompetitive behavior. But scholars have long debated the relationship between the two. Some argue that greater openness to trade makes antitrust laws unnecessary, while others contend that antitrust laws are still needed to realize the benefits of trade liberalization. Limitations of data have made this debate largely theoretical to date. We study the relationship between trade and antitrust regimes empirically using new data on antitrust laws and enforcement activities. We find that openness to trade and stringency of antitrust laws are positively correlated from 1950 to 2010 overall, but the positive correlation disappears in the early 1990s as a large number of countries adopt antitrust laws. However, we find a positive correlation between openness to trade and resources and activities for antitrust enforcement for both early and late adopters of antitrust regimes during this period.

1. Introduction

Increasing exposure to international trade and increasing the stringency of antitrust laws are both ways that countries can curb anticompetitive behavior. For instance, if a country wants to prevent a domestic manufacturer with monopoly power from charging supracompetitive prices, one solution would be to reduce barriers to foreign firms looking to import into the country. As long as the world

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price for the goods is lower than the price the domestic manufacturer is charging, import competition will make supracompetitive prices unsustainable. But another solution to the same problem is to adopt an antitrust law that prevents the manufacturer from abusing its dominant position in the market.

Although trade and antitrust law can achieve many of the same ends, scholars have long debated whether open economies will still benefit from enacting antitrust regimes. Some scholars argue that antitrust laws are redundant in the presence of open trade because foreign entrants are sufficient to destabilize cartels, constrain dominant companies, and undermine other anticompetitive practices, thereby keeping market competition in check (see, for example, Bhagwati 1968; Helpman and Krugman 1989; Blackhurst 1991; Neven and Seabright 1997; Melitz and Ottaviano 2008). In contrast, other scholars argue that, even with high levels of trade, antitrust laws are needed to ensure that private anticompetitive practices do not replace public barriers to trade and offset gains from trade liberalization (see, for example, Bond 2013; Motta and Onida 1997; Bartók and Miroudot 2008).¹ However, this debate has been largely theoretical to date.

This is likely because studying this question empirically requires solving two problems. First, it requires having a measure of the stringency of countries' antitrust regimes. Although a number of research projects have collected cross-national data on antitrust policies, these efforts have limitations that make it difficult to address this question. Second, estimating the effect of openness to trade (hereafter, trade openness) on antitrust policy requires identifying a method that can exogenously estimate countries' exposure to trade. This is because measures of trade openness typically express trade as a fraction of the total economy, but antitrust policies can affect the size of the economy and in turn directly influence the measure of trade openness. Given these obstacles, little is known about the relationship between countries' levels of trade openness and the antitrust laws they adopt.

We test the relationship between trade openness and antitrust laws while addressing both of these problems. To measure the stringency of antitrust laws, we draw on what we believe to be the most comprehensive data set on antitrust laws to date. To build the data set, we identified every country with an antitrust law in place by 2010 and then set out to code every antitrust law that they passed since their first antitrust law was adopted. We coded 700 antitrust laws for 126 countries. For each law, we coded 171 pieces of information, including detailed information about the scope of the authority it bestows on the government and the law's substantive provisions. Using these data, we constructed a new measure of the stringency of countries' antitrust regimes: the competition law index (CLI). In addition to coding antitrust laws, we also constructed several additional data sets on antitrust regimes—including a data set of antitrust agencies' resources

¹ Others suggest that the relationship between trade and at least merger policy is entirely ambiguous, with no reason to expect any particular correlation between the two (Horn and Levinsohn 2001).

and enforcement activities between 1990 and 2010—that we use to further probe this question.

To account for the endogenous relationship between antitrust laws and economic growth, we estimate a series of gravity equations to generate a measure of trade openness that is exogenous to countries' economic growth. We extend a version of a gravity model developed by Ortega and Peri (2014) to predict the value of trade between pairs of countries using information about the geographic relationship between the countries and their relative sizes. We build on their method by using more extensive trade data to generate predictions for the trade between pairs of countries from 1950 to 2010. By aggregating the total predicted trade for each country in each year, we generate estimates of countries' total predicted trade.

Our primary econometric specification uses two-stage least squares (2SLS) regressions to assess the relationship between trade openness and the stringency of antitrust laws (hereafter, antitrust stringency) while instrumenting for trade openness with our predicted trade measure. Using panel data from 1950 to 2010, we find that trade openness and antitrust stringency are positively correlated. This overall result holds when we use a variety of alternative methods to measure them. We then extend our analysis by estimating cross-sectional regressions for individual years. Doing so reveals that the positive correlation between trade openness and antitrust stringency disappears in the early 1990s. We show that this is not because the relationship changed for early adopters (countries that adopted antitrust regimes prior to 1990) but instead because there is no clear relationship between trade openness and the antitrust policies for the late adopters (countries that adopted antitrust regimes in the 1990s or thereafter). Finally, we extend our analysis using data on antitrust enforcement resources and activities from 1990 to 2010 that we collected by corresponding with 100 antitrust agencies around the world. Using these data, we find that although there is not a clear correlation between trade openness and antitrust laws from 1990 to 2010, there is a positive correlation between trade openness and greater antitrust enforcement during that time. Moreover, this relationship exists for both early and late adopters of antitrust regimes. One interpretation of this pattern is that countries with low exposure to trade may have adopted stringent antitrust laws after 1990 but have not necessarily enforced them.

Although we provide new evidence on the relationship between trade openness and antitrust policies, this paper has several limitations. Notably, our empirical strategy cannot show whether trade openness causes changes in antitrust law; instead, we can test only if there is likely a correlation. In addition, we do not address whether having both high levels of trade openness and stringent antitrust regimes leads to better economic performance. Our results also do not explain why countries with greater trade openness adopt stricter antitrust regimes. Countries might do so because combining trade and antitrust is welfare enhancing, but it is also plausible that countries adopt antitrust regimes to protect their markets from foreign competition as traditional tools for protectionism wane with the lib-

eralization of trade (compare Cremieux and Snyder 2016). Our focus is on documenting the empirical relationship between these two tools of economic regulation, and we leave these important related questions to future research.

This paper proceeds as follows. Section 2 outlines the prevalent theories of the relationship between trade openness and antitrust regulation. Section 3 describes the data we collected to measure antitrust stringency. Section 4 explains the approach we use to estimate trade openness by predicting trade between countries on the basis of their geography and size. Section 5 reports our primary results and a range of robustness tests that examine the overall relationship between trade openness and antitrust stringency. Section 6 conducts a series of cross-sectional regressions that analyze the trends by year. Section 7 explores the relationship between trade openness and antitrust enforcement resources and activities. Section 8 concludes.

2. The Relationship between Trade and Antitrust Law

We begin by outlining two common theoretical claims about the relationship between trade openness and antitrust law. A brief discussion of the literature that empirically tests the relationship between these two policies follows.

2.1. *Trade and Antitrust Law as Substitutes*

Many scholars suggest that trade liberalization may make adopting an antitrust regime unnecessary (Bhagwati 1968; Helpman and Krugman 1989; Blackhurst 1991; Neven and Seabright 1997; Melitz and Ottaviano 2008). According to this view, free trade is an effective way to ensure that markets remain competitive because facilitating entry checks market power (Baumol, Panzar, and Willig 1982). For example, when an economy is open to trade, monopolists refrain from abusing their market power because low external barriers ensure that competitors can enter the market and contest any such abusive practices. In this way, trade liberalization renders an antitrust intervention into monopolistic practices superfluous. Exports fueled by trade liberalization should also enhance market competition. New opportunities in export markets ensure that more firms can reach an efficient scale of production, which further spurs competition and reduces the need for an antitrust regime (Bartók and Miroudot 2008).

Relying on trade liberalization to safeguard market competition could have several advantages. First, foreign producers must incur certain fixed costs and variable trade costs to enter a new market that domestic producers do not incur. If foreign firms are able to enter and effectively compete even after incurring those costs, they are presumably more efficient and hence may act as an even more effective discipline on the market than domestic firms (Bartók and Miroudot 2008). Second, choosing free trade over antitrust regulation eliminates the need to rely on government bureaucracies. Many who remain skeptical of governmental intervention favor free trade and thus prefer to have imports disci-

pline anticompetitive behavior. This argument may gain all the more force today considering the complexities associated with antitrust regulators from over 130 countries all applying different rules in an effort to regulate the global marketplace. Finally, although trade openness may “act as an effective antitrust policy” (Pomfret 1992, p. 11), an effective antitrust policy does not act as an effective trade policy. For example, if the United States were to impose a 30 percent tariff on foreign producers today, foreign firms would likely not enter no matter how competitive the markets are behind the border. Domestic antitrust laws thus may do little to facilitate market entry in the presence of highly protectionist trade policy.

2.2. Trade and Antitrust Law as Complements

Alternatively, since both free trade and vigorous antitrust enforcement discipline dominant firms, governments seeking to constrain dominant companies may pursue both policies to the same end. Hence, there should be a positive relationship between free trade and the use of antitrust policies. Many scholars indeed argue that trade and antitrust policy are likely to be positively correlated (Bond 2013; Motta and Onida 1997; Bartók and Miroudot 2008; Bradford and Büthe 2012). For instance, Bartók and Miroudot (2008) acknowledge that trade policy and antitrust policy can act as substitutes because both destabilize cartels and hence foster competition. However, the authors nevertheless describe trade and competition policy as “mutually reinforcing.” This is in part because the benefits from collusion may be greater in the presence of open trade. For example, open trade allows companies to operate across multiple markets and to extract larger rents as a result (Bond 2013). Such cartels are also harder to detect and prosecute because evidence may be scattered across multiple jurisdictions. This may increase the net benefits from collusion, which makes anticompetitive behavior more likely in the presence of open trade. This could explain why several international cartels have successfully operated over multiple years and countries, even in periods coinciding with substantial economic openness (Connor 2007).

Governments may thus deliberately strengthen antitrust regulations in the presence of free trade to ensure that private anticompetitive conduct does not undermine gains from trade liberalization. This logic motivated the adoption of antitrust regulations by the European Union (EU), which initially adopted antitrust rules to complement efforts to liberalize trade between EU member states. The fear was that, without such laws, private companies could recreate barriers between member states and undermine the functioning of the single market. Antitrust laws were hence needed to ensure that the gains from free trade could be fully realized and preserved. Antitrust laws and trade policies are also often viewed as complementary because, while trade policy seeks to dismantle public barriers to trade, antitrust law removes private barriers. Similarly, while trade liberalization seeks to maximize a country’s total surplus, antitrust law is more com-

monly aimed at the maximization of consumer surplus.² These differences alone may explain governments' willingness to deploy both sets of policies as complementary tools to preserve economic openness and market competition.

In addition, even if foreign firms are able to enter a market, they may not be able to penetrate it and effectively compete if the market is tied by exclusive distribution agreements. For example, in the 1980s, the US government complained that, despite the liberalization of trade with Japan, US firms could not compete on the Japanese market in industries such as automobiles and photographic film. According to the critics, local antitrust laws failed to condemn exclusive distribution agreements that prevented US firms from having access to retailers and hence to local consumers (Bond 2013; Scherer 1994). This illustrates how trade policies may go only so far in rendering markets competitive, necessitating antitrust to complement them.

2.3. *Trade and Antitrust Law in Practice*

Only a handful of studies have tested the relationship between trade openness and antitrust law empirically. Waked (2010) finds that trade openness and antitrust enforcement resources are negatively correlated in a sample of developing countries. A few other studies support the view that trade alone can render markets competitive. Those studies generally examine the effects of import penetration on some measure of competition—like market concentration ratios or price-cost markup (Bartók and Miroudot 2008)—and find a negative correlation between trade openness and markups (Levinsohn 1993; Roberts and Tybout 1996; Tybout 2001). This implies that higher levels of imports lead to more competition and lower prices.

A few empirical studies instead suggest that trade openness and stringent antitrust regimes may be positively correlated. Feinberg (1990) studies the correlation between the reduction in tariffs and antitrust enforcement budgets in the United States, finding a positive association between trade liberalization and antitrust enforcement. Feinberg also finds a comparable association between antitrust fines and trade openness. Horn and Levinsohn (2001) reach a similar result when examining merger policies and trade liberalization. While their results are largely ambiguous, they conclude that trade liberalization may lead to stricter antitrust standards. Cremieux and Snyder (2016) examine cartel enforcement by the United States and the EU and find, among other things, that the United States imposes higher fines on foreign firms than domestic firms. If the nationality of firms influences the enforcement of antitrust policy as they suggest, it may follow that antitrust laws are enforced more aggressively in the presence of foreign competition.

² However, our coding of the goals of antitrust laws suggests that some countries—including Canada and New Zealand—pursue total welfare as opposed to consumer welfare through antitrust laws. This suggests that some jurisdictions see the goals of trade and antitrust policy as more overlapping as opposed to distinct yet complementary.

3. Measuring Antitrust Stringency

3.1. *Prior Data Collection*

The biggest hurdle to testing these theories on the relationship between trade and antitrust is having the data to do so. Although there have been a number of efforts to produce cross-national measures of antitrust policies (for example, Gutmann and Voigt 2014; Petersen 2013; Ma 2011; Buccirossi et al. 2011; Clougherty 2010; Waked 2010; Voigt 2009; Nicholson 2008; Hylton and Deng 2007; Kee and Hoekman 2007), all of the existing measures suffer from at least one major limitation.

First, several of the existing cross-national measures of antitrust law rely on a binary coding of whether antitrust law exists in a given country-year (Gutmann and Voigt 2014; Petersen 2013; Kee and Hoekman 2007). The problem with using a binary coding for our research question is that it disregards the significant variation among the laws. As a result, although it can be used to show whether countries adopt antitrust laws in response to trade openness, it cannot distinguish whether countries adopt more or less stringent regimes on the basis of their exposure to trade.

Second, most data sets that go beyond a binary measure have coded information on only a small sample of countries. For instance, Buccirossi et al. (2011) develop a comprehensive index of countries' antitrust regimes but do so for just 13 Organisation for Economic Co-operation and Development (OECD) members. Similarly, Clougherty (2010) collects data on the number of merger notifications in 32 countries, Kee and Hoekman (2007) use a sample of 42 countries, Nicholson (2008) uses a sample of 52 countries, and Voigt (2009) uses a sample of 58 countries. Hylton and Deng (2007) is an exception. In what we believe is the most ambitious previous effort to collect antitrust data, they code the statutes of 102 countries and produce an index of the overall stringency of national antitrust laws.

Third, most existing data sets cover a limited number of years. For instance, while Hylton and Deng (2007) develop a comprehensive measure of countries' antitrust regimes, their data cover only 2001–4. Others collect data for similar periods: Nicholson (2008) for 2003, Voigt (2009) for 1990–2000, Ma (2011) for 1990–2004, and Gutmann and Voigt (2014) for 2004–10.

3.2. *Our Data Collection*

Our goal was to comprehensively code every antitrust law every country had ever adopted.³ To do so, we first identified the jurisdictions that adopted an antitrust law by 2010.⁴ Our research identified 126 such countries. For each country, we went back to the first law that it enacted and tried to identify every subsequent

³ We fully explain the data collection process in Bradford et al. (2019).

⁴ We elected to start our data set with 2010 data for practical considerations: we began collecting data several years ago, and we selected a data point a few years prior so that we could reliably obtain copies of laws that had been passed.

law it passed until 2010. We included general antitrust laws, relevant sector-specific regulations, and other laws (such as criminal laws or constitutions) that contain provisions regulating market competition. Using this approach, we coded 700 antitrust laws in place by the end of 2010.⁵

Figure 1 indicates the countries that had an antitrust law in place every 10 years from 1960 to 2010. Figure 1 shows that, over the years, antitrust regimes have been adopted in countries around the world, including by democracies and non-democracies and by developed and developing countries alike. In fact, antitrust regimes have become so common that, by 2010, the 126 countries with antitrust laws contributed 95.4 percent of the world's gross domestic product (GDP). Figure 1 also shows that most countries adopted antitrust laws in the last 30 years, with the greatest expansion taking place in the 1990s.

In addition to identifying these laws, we developed a survey instrument to code their content. We built on the coding schemes used by Hylton and Deng (2007) and Nicholson (2008) as a starting point for our coding instrument. With the advantage of hindsight, we added variables to more thoroughly measure each country's antitrust laws. Our survey instrument thus includes 171 entry fields, with questions covering the scope of the antitrust authority, merger control, the abuse of a dominant position, and anticompetitive agreements.

To complete the coding, we recruited and trained a team of law students. We engaged students who were trained in different jurisdictions and possessed relevant language skills. Each law was assigned to two coders for independent review. Both coders followed identical procedures, reaching out for guidance as needed from us and senior coders who had extensive experience in the project. For countries that had passed multiple laws over time or in the same year, the coders researched the relationship between each law so that we could annualize the data and have an accurate picture of a country's antitrust regime in any given year.⁶ Once two coders completed coding laws for a country, a third coder completed a discrepancy analysis by reviewing all fields in which the original coders provided differing responses, consulting the text of the underlying law. The output of the discrepancy analysis produced a final consensus response to every field for every law. Countries that did not have a law in a given year were coded 0 for all variables. We thus created a country-year data set for all countries in the international state system.

⁵ We have not completed the coding of laws in three jurisdictions. We were unable to obtain a copy of laws we believe to exist for two countries—Djibouti and Iran—and we have been unable to complete coding of the Faroe Islands because we have not yet identified coders with appropriate language skills. To account for this, all of our regressions include an unreported indicator variable for the country-years for which we have identified a law that we have not yet been able to code.

⁶ We researched the relationship between laws to understand whether subsequent laws supplemented or replaced prior provisions. For instance, if a country passed a law in 1980 that required merger notification and then passed a new law in 1990 that did not mention merger notification, we tried to determine whether that was because the new law removed the merger notification requirement or did not mention it because merger notification was already required.

Figure 1. Countries with antitrust laws over time

3.3. *Creating the Competition Law Index*

Once we had coded the contents of the world's antitrust laws, we developed a measure of their stringency. Following prior research (for example, Hylton and Deng 2007; Nicholson 2008; Buccirosi et al. 2011), we elected to develop an index that measures the stringency of each country's antitrust law in a given year. Because we fully introduce the CLI in Bradford and Chilton (2018), we only briefly describe it here. The goal of the CLI is to measure the intensity of competition regulation in any given country in any given year. It does so by aggregating the prohibitive elements of the various components of countries' antitrust laws. The more types of behaviors the law prohibits or the more extensive remedies the law entails, the higher the CLI score. At the same time, the more the law recognizes defenses and exemptions from the law, the lower the CLI score. At this point, it is important to stress that the CLI is not a measure of the quality of an antitrust regime. Instead of creating a coding of whether regimes have optimal antitrust regimes, the CLI simply codes whether countries have provisions that extend or limit the possible scope of antitrust regulation. For instance, some established antitrust jurisdictions have lower CLI scores because of their common tendency to include defenses that call agencies to consider procompetitive effects of the conduct or transaction in question.⁷

The CLI consists of two equally weighted parts: the first captures the authority that a country's antitrust law conveys, and the second captures the substance of the law. By "antitrust authority," we refer to the broader structure of the antitrust regime, including the powers that the law gives to enforce antitrust laws. These provisions determine who can bring antitrust suits and what remedies can be imposed if a violation is found. These provisions also define whether all industries and enterprise types fall within the scope of the law and whether the law can be applied extraterritorially.

By "substance of the law," we refer to rules in three substantive areas: merger control, abuse of dominance, and anticompetitive agreements. "Merger control" refers to provisions regulating the notification of proposed mergers, the standards by which mergers are reviewed, and the defenses that firms can advance to argue that the anticompetitive effects of a merger may be offset by benefits the transaction generates. "Abuse of dominance" refers to provisions that determine the various types of a company's conduct that constitute anticompetitive abuses of dominant position. Finally, "anticompetitive agreements" refer to prohibitions on both horizontal and vertical agreements between companies. This includes regulating common practices of cartels such as price fixing and market sharing but also vertical restraints such as resale price maintenance. These three areas are weighted equally.

To construct the CLI, for each country-year, countries are assigned points according to the presence of the variables listed in Table 1. We then equally weight

⁷ See Bradford and Chilton (2018) for a longer justification of the way the competition law index (CLI) is constructed. Section OA1 of the Online Appendix provides additional information about the CLI.

Table 1
Components of the Competition Law Index

	Score		Score
Authority:		Merger control:	
Private right of action	1	Pre-merger notification	1
Fines	1	Mandatory notification	1
Imprisonment	1	Substantive assessment: economic	1
Divestitures	1	Substantive assessment: public interest	1
Damages	1	Efficiency defense	-.5
Extraterritoriality	1	Failing firm defense	-.5
Industry exemptions	-.5	Public interest defense	-.5
Enterprise exemptions—categorical	-.5	Anticompetitive agreements:	
Abuse of dominance:		Price fixing	.5
General prohibition	2	Market sharing	.5
Market access	.25	Output limitations	.5
Tying	.25	Bid rigging	.5
Discounts	.25	Tying	.5
Unfair pricing	.25	Exclusive dealing	.5
Discriminatory pricing	.25	Resale price maintenance	.5
Predatory pricing	.25	Elimination of competitors	.5
Retail price maintenance	.25	Efficiency defense	-.5
Other abusive acts	.25	Public interest defense	-.5
Efficiency defense	-.5		
Public interest defense	-.5		

the authority and substance components of the index. We then normalize all scores to be between 0 and 1. Country-years without an antitrust law in place are scored 0, and a country receives the same score for all years that it has the same regime in place. Figure 2 shows the score for each country in 2010 and the substantial variation in countries' antitrust regimes as measured by the CLI. For example, Canada and Australia notably have more stringent regimes than the United States. (Although, as we discuss in Section 5.3, this may be due to the oversized role that the common law plays in antitrust regulation in the United States.)

Of course, one drawback of an index such as the CLI is that it relies on subjective decisions about what variables to include and how to weight them. The decisions we made are based on discussions with leading academic experts and representatives of antitrust authorities and our own judgments. In Section 5.3, however, we test the robustness of our findings using several alternative approaches to measuring the stringency of antitrust regimes.

4. Measuring Trade Openness

4.1. Empirical Approach

The next hurdle when testing whether trade openness is associated with greater antitrust stringency is measuring trade openness. The fundamental difficulty with doing so is that trade openness both causes economic growth and is a consequence of economic growth. Thus, trade may produce economic changes that

Figure 2. Competition law index score by country, 2010

lead a country to adopt a stringent antitrust regime, but the adoption of an anti-trust regime may produce economic changes that result in more trade. In other words, the relationship between trade and antitrust policy is endogenous.

Fortunately, scholars have developed methods to produce exogenous estimates of countries' openness to trade. The first breakthrough that made this possible is the gravity equation, which was introduced by Tinbergen (1962) and has been part of mainstream macroeconomics since the mid-1990s (see generally Head and Mayer 2014). This equation has proven surprisingly stable across time between pairs of countries and using different methodologies (Chaney 2017). The basic insight of gravity models is that the trade between two countries can be predicted by the size of their economies and the distance between them. That is, bilateral trade is proportional to any two countries' GDP and inversely proportional to their distance, or more formally,

$$\text{Trade}_{A,B} \propto \frac{(\text{GDP}_A)^\alpha (\text{GDP}_B)^\beta}{(\text{Distance}_{AB})^\zeta}. \quad (1)$$

Although gravity equations make it possible to predict trade, the standard version of the equation relies on using GDP as an input. Producing an exogenous estimate of trade while using the gravity equation thus required a second breakthrough. This came from Frankel and Romer (1999), who argue that the gravity equation demonstrates that geography is a powerful predictor of trade and of a country's income. But although geography can influence a country's wealth, the country's wealth cannot influence its geography. The result is that geographic determinants of wealth can be introduced into the framework of a gravity equation to produce an estimate of expected trade into a country in a given year. Using this insight, Frankel and Romer estimate countries' predicted trade on the basis of their geography and then use predicted trade as an instrument for trade openness. Frankel and Romer's original implementation has since been criticized for not accounting for all the ways in which geography can influence growth (Rodríguez and Rodrik 2000; Rodrik, Subramanian, and Trebbi 2004), but the basic insight underlying their model remains valid, and the approach for predicting trade is still used.

4.2. Implementation

To implement this method, we follow the approach developed by Ortega and Peri (2014). Ortega and Peri develop an exogenous instrument for trade to estimate the relationship between countries' openness to trade and migration and those countries' incomes.⁸ They build on Frankel and Romer (1999) and subsequent developments to produce estimates of the bilateral trade between countries in 2000, using information about the countries' relevant geography and size. The advantage of these equations is that, after controlling for a country's size, vari-

⁸ We set aside the part of Ortega and Peri (2014) that incorporates migration and focus solely on trade.

ations in the values of predicted trade shares (PTSH) are driven solely by “the relative position of a country in terms of its geography and cultural coordinates” (Ortega and Peri 2014, p. 234).

Ortega and Peri (2014) use a data set with observations for pairs of countries and data on the trade and relevant geographic variables for each pair. Using these data, they estimate the following equation to estimate the trade shares (TSH) that each country receives from every other country:

$$\begin{aligned}
 \ln \text{TSH}_{cj} = & \gamma_1 \ln(\text{Dist})_{cj} + \gamma_2 \ln(\text{Population})_c + \gamma_3 \ln(\text{Population})_j \\
 & + \gamma_4 \ln(\text{Area})_c + \gamma_5 \ln(\text{Area})_j + \gamma_6 (\text{Landlocked})_{cj} \\
 & + \gamma_7 (\text{Border})_{cj} + \gamma_8 \ln(\text{ComLang})_{cj} + \gamma_9 \ln(\text{ComOffLang})_{cj} \\
 & + \gamma_{10} \ln(\text{Shared Time Zone})_{cj} + \gamma_{11} \ln(\text{Colony})_{cj} \\
 & + \gamma_{12} \ln(\text{Origin Country Hegemony})_{cj} + \gamma_{13} \ln(\text{Dist})_{cj} (\text{Border})_{cj} \\
 & + \gamma_{14} \ln(\text{Population})_c (\text{Border})_{cj} + \gamma_{15} \ln(\text{Population})_j (\text{Border})_{cj} \\
 & + \gamma_{16} \ln(\text{Area})_c (\text{Border})_{cj} + \gamma_{17} \ln(\text{Area})_j (\text{Border})_{cj} \\
 & + \gamma_{18} \ln(\text{Landlocked})_c (\text{Border})_{cj}.
 \end{aligned} \tag{2}$$

The dependent variable TSH is the value of the trade (exports plus imports) between country c and country j divided by the GDP of country c . The equation includes 12 explanatory variables: distance between the countries, population and area of both countries, the number of countries that are landlocked, and dummy variables for a shared border, common language, common official language, shared time zone, colonial history, and prior hegemonic relationship. The equation includes interactions for the geography variables and shared borders.

After estimating the gravity equation, Ortega and Peri (2014) calculate the predicted values for each country pair and aggregate them for each country c . We replicate the specifications used by Ortega and Peri in equation (2). Also following Ortega and Peri, to aggregate the predicted trade shares for each country c , we define $\mathbf{Z}_{cj}$ as the vector of explanatory variables and γ as the vector of coefficients in equation (2). We then aggregate the predicted trade share for country c by using the following formula:

$$\widehat{\text{TSH}}_c = \sum_{j \neq c} \exp(\hat{\gamma} \mathbf{Z}_{cj}). \tag{3}$$

Ortega and Peri (2014) generate PTSH only for 2000, but because we have extensive time-series data on antitrust laws, we set out to develop a prediction of trade between countries for as long a period as possible. This requires two key changes to Ortega and Peri’s approach. First, we use a different source of trade data to cover more years. To obtain data on bilateral trade from 1950 to 2010, we use the Correlates of War bilateral trade data set and the International Monetary Fund’s Direction of Trade Statistics data set.⁹

⁹ Despite using these two data sets, there are dyad-year observations for which the data are missing for various reasons. We also exclude data from Liberia and Tuvalu from our analysis because of extreme fluctuations in their trade data.

Second, we estimate our gravity equation separately for each year from 1950 to 2010. The reason for doing so is that, although the variables used to instrument for trade are primarily time invariant, the geographic costs of trade change over time (Feyrer 2009a, 2009b). Estimating the equation separately for each year allows the coefficients for the instrumental variables to take different values for each year (see Badinger and Nindl 2014). It is important to note that, although many papers that use this strategy to estimate trade openness rely exclusively on a single year of cross-sectional data (for example, Frankel and Romer 1999), others either pool observations across years to test the overall relationships (for example, Cavallo and Frankel 2008; Calderón, Chong, and Stein 2007; Badinger and Nindl 2014; Calderón and Kubota 2018) or estimate regressions separately for multiple years (for example, Irwin and Terviö 2002). Because the relationship between trade and antitrust law appears to have changed over time, we adopt the latter two strategies (reported in Sections 5 and 6).

Despite these two differences, the correlation between our estimates and the estimates in Ortega and Peri (2014) for 2000 is .79; when we exclude observations for countries for which missing data led Ortega and Peri to estimate no trade shares for a country, the correlation between our estimates is .89.¹⁰ To provide a sense of the data on trade openness, Figure 3 plots PTSH for 2010 by quintile. Table 2 provides descriptive statistics for the data we use in the gravity equations and the analysis in Sections 5–7.

5. Primary Analysis

5.1. Estimation Strategy

To estimate whether greater trade openness is associated with increased anti-trust stringency, we use a 2SLS regression. In the first stage, we instrument for TSH for country c in year i with the PTSH for country c in year i . To ensure that our instrumental variable isolates the amount of predicted trade attributable to geography, following Ortega and Peri (2014) our first-stage regression also controls for each country's population and area. We lag all time-variant variables 1 year. Our first-stage regression takes the following form:

$$\text{TSH}_{c,i-1} = \beta_0 + \beta_T \text{PTSH}_{c,i-1} + \beta_P \ln \text{Population}_{c,i-1} + \beta_A \ln \text{Area}_c + \varepsilon. \quad (4)$$

In the second stage, we estimate the impact of TSH on CLI score while controlling for the country's size. The second-stage equation is thus

$$\text{CLI}_{c,i} = \beta_0 + \beta_T \text{TSH}_{c,i-1} + \beta_P \ln \text{Population}_{c,i-1} + \beta_A \ln \text{Area}_c + \varepsilon. \quad (5)$$

¹⁰ Section OA2 of the Online Appendix compares our estimates of predicted trade shares (PTSH) with those in Ortega and Peri (2014).

Figure 3. Predicted trade share by country, 2010

Table 2
Descriptive Statistics

	N	Mean	SD	Min	Max
Gravity equation data:					
Country-level characteristics:					
Population of origin country (millions)	10,063	29.10	109.91	.01	1,371.22
Population of destination country (millions)	10,750	27.92	106.66	.00	1,371.22
Area of origin country (thousands of km ²)	10,063	744.81	1,874.62	.02	22,275.98
Area of destination country (thousands of km ²)	10,750	776.34	2,137.85	.02	22,275.98
Dyad-level characteristics:					
Population-weighted distance (km)	855,954	8,009.86	4,470.91	60.77	19,781.39
Landlocked origin + landlocked destination	855,954	.34	.53	0	2
Time zone difference	855,954	4.67	3.40	0	12
Origin and destination are contiguous	855,954	.02	0	0	1
Formerly in a colonial relationship	855,954	.01	0	0	1
Origin is or was hegemon of destination	855,954	.01	0	0	1
Common language spoken by > 9% of population	855,954	.15	0	0	1
Common official language	855,954	.17	0	0	1
Primary regression data:					
CLI	9,070	.19	.29	0	1
PTSH	7,973	.54	.29	.04	2.19
Trade Openness	8,162	.51	.40	.00	6.33
Population (ln)	8,823	2.16	1.40	.01	7.20
Area (ln)	9,020	11.83	2.34	3.09	16.92
Antitrust enforcement data:					
Budgets	9,005	.09	.32	0	1.61
Staff Size (ln)	9,070	.35	1.20	0	7.81
Investigations (ln)	9,070	.17	.72	0	8.11
Remedies (ln)	9,070	.10	.49	0	7.41

Table 3
Trade Openness and Antitrust Stringency:
Reduced-Form Baseline Results

	(1)	(2)	(3)
PTSH	.313** (.055)	.334** (.050)	.136* (.060)
Population (ln)	.098** (.019)	.095** (.017)	.071** (.018)
Area (ln)	.006 (.010)	.015+ (.009)	.018* (.009)
Region dummies	No	Yes	Yes
Time trend	No	No	Yes
R^2	.212	.335	.390

Note. The dependent variable is the competition law index. Robust standard errors clustered by country are in parentheses. $N = 7,973$.

+ $p < .1$.

* $p < .05$.

** $p < .01$.

5.2. Primary Results

Tables 3 and 4 report our baseline results. We begin in Table 3 by simply presenting a reduced-form pooled OLS regression that estimates the impact of PTSH on CLI. Column 1 controls for the size of the country, column 2 accounts for regional differences in trade and antitrust policies, and column 3 accounts for the possibility that there is a secular trend in antitrust stringency.¹¹ In Table 4, we use the 2SLS regression strategy discussed in Section 5.1. In these regressions, in the first stage, PTSH is an instrument for TSH.¹²

There are several things worth noting about the regression specifications in Tables 3 and 4. First, the reason we do not include a wider range of control variables is that trade has previously been shown to impact everything from income (Frankel and Romer 1999) to levels of democracy (López-Córdova and Meissner 2008), and thus many standard control variables would be inappropriate since they are also outcomes of exposure to trade. Second, we use region fixed effects instead of country fixed effects in part because there is little variance in most countries' CLI scores from year to year, and thus we believe that country fixed effects are inappropriate. That said, the results that include a time trend are robust to the addition of year and country fixed effects.

Tables 3 and 4 suggest that, for countries of the same size, countries in which trade makes up a larger share of the economy are also likely to have more stringent antitrust laws. The results attenuate with the addition of the time trend and

¹¹ The time trend we include is not country specific. In addition, the results using a time trend are robust to using year fixed effects instead of a linear time trend.

¹² We report Kleibergen-Paap F -statistics for weak identification, which all lie above the most demanding critical values reported by Stock and Yogo (2005). We can thus reject the null hypothesis that PTSH is a weak instrument for trade openness.

Table 4
Trade Openness and Antitrust Stringency:
Two-Stage Least Squares Baseline Results

	(1)	(2)	(3)
Second stage:			
Trade Openness	.624** (.126)	.672** (.130)	.378+ (.193)
Population (ln)	.107** (.023)	.115** (.021)	.088** (.021)
Area (ln)	.027 (.017)	.032* (.016)	.027* (.013)
First stage:			
PTSH	.501** (.063)	.496** (.065)	.358** (.078)
Population (ln)	-.014 (.021)	-.030 (.019)	-.046* (.020)
Area (ln)	-.034+ (.018)	-.025 (.018)	-.023 (.018)
Region dummies	No	Yes	Yes
Time trend	No	No	Yes
R ²	-.197	-.166	.222
F-statistics	63.803	58.906	21.280

Note. The dependent variable is the competition law index. Robust standard errors clustered by country are in parentheses. $N = 7,970$. Kleibergen-Paap F -statistics are for weak identification.

+ $p < .1$.

* $p < .05$.

** $p < .01$.

region fixed effects but remain positive and statistically significant. To illustrate these results, Figure 4 presents a binned scatterplot that shows the relationship of trade openness to countries' CLI scores using the regression specification from column 3 of Table 4.¹³ Figure 4 reveals a positive relationship between predicted trade shares and CLI scores.

The size of the effect is also economically significant. To measure this, we calculate the marginal effects associated with a change in a country's level of trade shares. While holding the other variables at their means, for column 3 in Table 4, moving from the 10th percentile value of TSH (.16) to the 90th percentile (.95) is associated with a .29 change in the CLI score. As a reminder, the CLI score is normalized to range from 0 to 1. To put this in perspective, the country with the median CLI score in 2010 is .56 (approximately the value for the Ivory Coast). An increase of .29 would result in a score of roughly .85, which is roughly 80 countries higher on the CLI scale (approximately the value for Estonia).

¹³ Figure 4 first regresses trade shares (TSH) on PTSH (while controlling for population, area, region fixed effects, and a time trend) and then plots the predicted values from that regression against the CLI while controlling for the same variables.

Figure 4. Relationship between trade and the competition law index

5.3. Robustness Checks

These results are robust to using alternative measures of antitrust policy and trade openness. Section OA3 of the Online Appendix reports our results using alternative measures.

Measuring Antitrust Regulation. We conduct four tests to ensure that our results are not driven by the way we construct the CLI. First, we create a subindex for each of the four categories of variables reported in Table 1 and then reestimate our primary specifications using each of them as the dependent variable. Second, instead of weighting the variables in Table 1, we simply count the number of provisions each country has in its law in a given year (for example, if a country scores a 1 for each of the 36 variables, its score would be 36). Third, we use factor analysis of the variables in Table 1 to produce a new weighting scheme driven entirely by the characteristics of the data. Fourth, we create a binary variable for the presence of an antitrust regime by coding all countries with a CLI score greater than 0 as 1. Across these additional specifications, the results are consistently positive and statistically significant. As we explain in Section 7, our results are also robust to using measures of antitrust enforcement resources and activities instead of the CLI.

Accounting for the Role of the Judiciary. In some countries, judge-made law is a major source of antitrust regulation. In the United States, for example, courts have added numerous rules to the relatively sparse regulation of anticompetitive behavior found in statutes. If there are many countries like the United States,

our coding of laws on the books may systematically bias our measure of antitrust stringency. To investigate this, we surveyed antitrust experts from around the world about the role that courts play in the development of antitrust law in their countries. In the survey, we asked, “In practice, do the courts generate new law by changing the scope of the antitrust statutes in [country]? Please answer on a scale from 1 (no role) to 5 (extensive role).” We recruited experts to take the survey by circulating it to contacts we made while collecting antitrust data, attendees at international antitrust conferences, and members of the Academic Society of Competition Law. We received 166 responses from 86 countries with antitrust regimes.¹⁴ The results of the survey suggest that courts play a large or extensive role in the development of antitrust law in just 12 countries (most of which are known for their common-law legal traditions).¹⁵ We then reestimated our baseline specifications while controlling for countries where courts play a large role in the development of antitrust law.¹⁶ The coefficients of interest remain substantively similar to our primary results.

Accounting for Exemptions and Narrow Applications. Countries often explicitly stipulate that antitrust laws do not apply uniformly. Instead, the law or a given provision may not apply to a particular industry or enterprise. To account for this, we created a separate data set of the exemptions in countries’ antitrust laws by recoding the laws in our data set to record whether each provision contained any of the following exemptions: general industry exemptions (for example, exempting the telecommunications industry from tying prohibition), complete enterprise-type exemptions (for example, exempting all state-owned enterprises from tying prohibition), partial enterprise-type exemptions (for example, exempting state-owned enterprises from tying prohibition to the extent that they engage in provision of public services), or narrow applications (for example, specifying that the telecommunications industry is the only industry covered by the tying provision). Using these additional, more nuanced data, we recoded the 36 variables composing the CLI on the basis of the presence of these exemptions. We recoded countries coded as 1 for a given provision in a given year to .8 if there was a general industry exemption, to .8 if there was a complete enterprise-type exemption, to .9 if there was a partial enterprise-type exemption, and to .1 if there was narrow industry coverage.¹⁷ The results remain positive and statistically significant when using the adjusted CLI as the dependent variable.

Accounting for European Union Law. Our research suggests that there are seven regional organizations that in some way regulate their members’ antitrust regimes (see Section 6). For five of them, the regional law and members’ national laws operate in different spheres. For instance, Common Market for Eastern and

¹⁴ For countries with multiple respondents, we averaged the responses.

¹⁵ The 12 countries that received an average score of 4 or higher are Argentina, Australia, Austria, Germany, Hong Kong, Ireland, Israel, New Zealand, Nicaragua, Spain, the United Kingdom, and the United States.

¹⁶ We control for countries with antitrust regimes if we did not receive a response to our survey.

¹⁷ Provisions with narrow industry coverage are recoded from 1 to 0 in our primary specifications to reflect the fact that these laws are not of general applicability.

Southern Africa (COMESA) rules address only cross-border anticompetitive conduct and leave individual member states to regulate their domestic markets. But this is not true of the EU and the European Economic Area (EEA), which have antitrust rules that split authority between the member states and the regional organization (for example, some issues are regulated by national law, some by EU/EEA law, and some by both). To account for this, we coded the EU/EEA competition laws and then recoded the CLI scores of EU/EEA members to account for the regional laws. For instance, when constructing the CLI for Germany, we apply the German national coding for variables if the EU treaty stipulates that member states' laws take precedence. But for variables for which the EU law takes precedence, the recoding uses EU law instead of German coding for the variable. And if EU law allows for enforcement under either German law or EU law, we count any given provision as existing if it can be derived from either German law or EU law. When accounting for antitrust rules in this way, the results remain positive and statistically significant.

Measuring Trade Openness. We also test the robustness of our primary results using two alternative measures of trade openness that rely on countries' policies instead of trade flows. First, we use the Sachs and Warner (1995) measure of trade openness. This is a binary indicator variable that treats economies as closed if any of the designated conditions hold (including average tariff rates exceeding 40 percent, nontariff barriers covering over 40 percent of imports, and so on).¹⁸ Second, we use data from the KOF globalization index (Dreher 2006) for economic globalization, which captures policies on trade and investment flows and on trade and capital account restrictions from 1970 to 2013.¹⁹ We find positive and statistically significant relationships with both measures and CLI scores.

6. Cross-Sectional Analysis

Our analysis so far has used panel data with country-year observations. There are, however, several limitations to this approach. One concern is that there is relatively little year-to-year variance in countries' antitrust laws. While some countries passed antitrust laws every few years, other countries passed one law and never amended it, and others have never passed an antitrust law. Another concern is that although we estimate the gravity model in equation (2) separately for each year (which allows the predicted trade to change in response to shifts in trade flows and the coefficients to take on different values as the geographic costs of trade evolve), the values for the variables included in the regression do not change from year to year. Finally, the relationship between trade openness

¹⁸ A downside of this measure is that it is available only until 1992, which is particularly problematic for our application because antitrust laws became much more common in the 1990s.

¹⁹ We elected to use the KOF globalization index as a measure of trade openness because it incorporates coding on policy for an extended period. But since the measure incorporates data on trade and investment flows as well as policies, this measure may suffer from the same endogeneity problems as using a standard measure based on ratios of trade to gross domestic product.

Figure 5. Cross-sectional regressions, 1960–2010

and antitrust laws may have evolved, and pooling all observations may thus mask considerable variation over time.

We thus explore the relationship between trade openness and antitrust law using cross-sectional regressions. Figure 5 reports results while subsetting the data for each year from 1961 to 2010.²⁰ Figure 5 plots the point estimate and 90 percent confidence interval for the variable TSH using the 2SLS regression specification from column 2 of Table 4. Figure 5 reveals that the point estimates are positive for all years from 1960 until 1991 and that the estimates are statistically significant at the .1 level or higher in 23 of those years. But the pattern changes after 1991, after which the point estimates are either approximately 0 or, in a handful of years, slightly negative. In other words, the positive relationship between trade openness and antitrust stringency appears to disappear in the 1990s.

There are several possible explanations for this pattern. Countries' exposure to trade may have changed as a result of shocks to the global economy during the 1990s, including the creation of the World Trade Organization, the fall of the Soviet Union and the opening of the eastern bloc, the rise of China's exporting power, and changes to transportation costs and communications technology. This could have changed the relationship between trade openness and antitrust law even for countries with established antitrust agencies. In addition, the number of countries with antitrust regimes exploded in the 1990s, and it is possible that the countries that adopted regimes during this period may have done so for different reasons than countries that regulated antitrust policies earlier.

To investigate these explanations, Figure 6 reports the results of regressions es-

²⁰ The coefficients are also positive in each year from 1950 to 1960. We do not report these data, however, because there are extremely large confidence intervals because of the limited number of countries with antitrust laws during this period.

Figure 6. Trade openness and the competition law index, 1990–2010

timated on two subsamples of our data: early adopters (excluding countries that adopted antitrust laws after 1990) and late adopters (excluding countries that adopted antitrust laws before 1990).²¹ In Figure 6, the top panels graph the results of the same cross-sectional regressions reported in Figure 5, and the bottom panels present binned scatterplots created when estimating regression specifications from column 3 of Table 4 while pooling the data from 1990 to 2010.²²

The results in Figure 6A suggest that there is still a positive relationship between trade openness and antitrust policies between 1990 and 2010 when excluding late adopters. Although the results reported in Figure 6A are not statistically significant for this sample, the coefficients are positive, and the size of the estimates is similar to those from Figure 5 for the years before 1990—they are simply less precisely estimated. As the binned scatterplot shows, the correlation is positive overall for this sample. Figure 6B excludes countries that had established antitrust agencies as of 1990. The results suggest that there is not a positive relationship between trade openness and antitrust stringency when excluding the early adopters of antitrust law. Taken together, the results in Figure 6 suggest that the positive correlation between trade openness and antitrust stringency does not

²¹ Both samples include countries that did not adopt antitrust laws before 2010.

²² Section OA4 of the Online Appendix recreates Tables 3 and 4 for early adopters and late adopters.

disappear after 1990 because of changes in the relationship for jurisdictions with established regimes (that is, early adopters); it disappears because there is not a strong correlation between trade openness and antitrust stringency in jurisdictions that adopted their regimes during this period (that is, late adopters).

The next logical question is why late adopters of antitrust laws pass statutes with levels of stringency that do not positively correlate with their exposure to trade. Perhaps the most obvious explanation is that established jurisdictions like the EU and the United States began to urge developed and developing countries alike to adopt antitrust laws (Fox 1997). The EU, for instance, systematically requires countries to adopt antitrust laws as a condition of signing trade agreements with the EU or joining the EU (Hoekman 2002). Countries thus may have adopted antitrust laws after, or as a precondition to, signing a preferential trade agreement (PTA) or joining a regional organization (RO) (Kronthaler and Stephan 2007) and not for reasons that stem from their levels of trade openness.

We also collected data that can be used to preliminarily explore whether the presence of antitrust requirements in PTAs and ROs can help to explain the changing relationship between trade openness and antitrust stringency that began in the 1990s. First, we built a new data set of antitrust provisions in PTAs using the Design of Trade Agreements (DESTA) database (Dür, Baccini, and Elsig 2014).²³ The DESTA team provided us with copies of the 596 PTAs for which they obtained copies of the text. We developed a survey instrument to code the PTAs, extending a sample of PTAs coded earlier (Bradford and Büthe 2015). We coded whether the PTA contained an obligation for signatories to have or maintain antitrust laws and identified 173 PTAs that contained such an antitrust requirement. Figure 7 maps the countries that were signatories of a PTA that contained an antitrust requirement by 2010. As Figure 7 shows, there was an explosion of PTAs that required each party to adopt or maintain an antitrust law during the 1990s. In fact, of the 173 PTAs with such an antitrust requirement, 161 are from 1991 or later. Moreover, almost every country in the world has signed a PTA with an antitrust requirement. Notably, although only 126 countries had an antitrust law in place by 2010, 179 countries had signed a PTA that requires them to do so.²⁴

Second, we researched ROs that regulate antitrust policy in some way. The degree of integration facilitated by ROs varies, ranging from the creation of custom unions that establish uniform external tariffs to the creation of common markets that allow for the free flow of capital and labor (Ravenhill 2017). We identified seven ROs that regulated members' antitrust policies by 2010: the Andean Community, the Caribbean Community, COMESA, the EEA, the EU, the Economic Community of West African States, and the West African Economic and Mone-

²³ For more information about the Design of Trade Agreements (DESTA) data set, see DESTA, Project Description (<https://www.designoftradeagreements.org/project-description/>). We thank the DESTA team for sharing the texts of the preferential trade agreements (PTAs).

²⁴ This discrepancy may be because the requirements of PTAs are not enforced or because some PTAs have long implementation periods. However, we leave to future research the question of why so many countries do not have antitrust laws despite having signed PTAs requiring them.

Figure 7. Signatories to a preferential trading agreement that requires antitrust policies

Figure 8. Membership in regional groups that require antitrust policies

tary Union. Figure 8 maps the countries that are members of these ROs. In total, 80 countries are members of these organizations, 50 of which had domestic antitrust laws in place by 2010. Of those countries, 20 had antitrust regulations prior to 1990, but 30 adopted them between 1990 and 2010.

Table 5 reports the results of regressions testing whether PTAs and ROs may explain the changing relationship between trade openness and antitrust stringency that began in the 1990s for late adopters. The table includes observations for country-years between 1990 and 2010 for which the country has signed a PTA with an antitrust requirement and observations for the same time period for which the country is a member of one of the seven ROs.²⁵ The results for both samples suggest that there is no clear relationship between trade openness and antitrust stringency for these countries. We caution, however, that these results should not be interpreted causally, and further research is needed to understand the role that PTAs and ROs have in the adoption of antitrust policies. In fact, although some prior research explores the antitrust provisions of PTAs and ROs (Bradford and Büthe 2015; Sokol 2008), there is limited research exploring how these provisions have translated into domestic policies (Hoeffken 2016). Our results suggest that this may be an important avenue for inquiry.

7. Trade Openness and Antitrust Enforcement

The results in Section 6 suggest that the stringency of the antitrust laws that many countries adopted after the 1990s do not positively correlate with their exposure to trade. Of course, statutes may not accurately capture the stringency of countries' antitrust regimes. Some countries with sparse antitrust laws may aggressively enforce them, while some countries with stringent laws may never pursue a single case. For this reason, although the results in Section 6 suggest that the positive relationship between trade openness and antitrust laws disappears after 1990, it does not mean that there was not a positive relationship between trade openness and antitrust enforcement.

We also built a data set on antitrust enforcement resources and activities that allows us to answer this question.²⁶ Because some countries with antitrust laws have not established agencies to enforce those laws, we first identified jurisdictions with antitrust agencies. For the agencies we identified, we reviewed publicly available information about their enforcement resources and activities from their websites and annual reports, resources such as the *Global Competition Review* and the online platform Getting the Deal Through, and research by organizations like the OECD and the United Nations Conference on Trade and Development (UNCTAD). To supplement the publicly available information, we produced questionnaires individually tailored for each agency and contacted the agencies directly to ask for missing information or clarification when publicly available in-

²⁵ Table 5 excludes countries that adopted antitrust laws prior to 1990—early adopters—because, instead of being influenced by the antitrust requirements of PTAs and regional organizations, those countries were likely pushing for their inclusion.

²⁶ We fully explain the data collection process in Bradford et al. (2019).

Table 5
Effect of Preferential Trade Agreements and Regional Organizations

	Reduced Form			Two-Stage Least Squares		
	(1)	(2)	(3)	(4)	(5)	(6)
Preferential trade agreements:						
PTSH	.167 ⁺ (.092)	-.043 (.068)	-.104 (.071)			
Trade Openness				.380* (.181)	-.112 (.193)	-.329 (.294)
Regional organizations:						
PTSH	.055 (.112)	-.064 (.116)	-.227* (.094)			
Trade Openness				.098 (.187)	-.137 (.269)	-.580 ⁺ (.348)
Region dummies	No	Yes	Yes	No	Yes	Yes
Time trend	No	No	Yes	No	No	Yes

Note. Dependent variables are from the antitrust enforcement data set. Robust standard errors clustered by country are in parentheses. All regressions include controls for population and area. The first-stage instrument is PTSH.

⁺ $p < .1$.

* $p < .05$.

formation was conflicting. We typically contacted an agency following an introduction by a personal contact in the agency, local antitrust practitioners, international legal academia, or an organization such as UNCTAD or the International Competition Network. In response to our inquiries, 103 agencies cooperated with us. We were able to obtain some data from 112 agencies representing 100 jurisdictions (our research suggests that 116 jurisdictions had an agency in 2010).²⁷

From these data, we use four variables to measure antitrust resources and enforcement: the variable Budget is the log of the amount of money allocated for an antitrust-specific agency divided by the log of the country's GDP,²⁸ Staff Size is the log of the number of employees who work at the antitrust agency,²⁹ Investigations is the log of the number of agency investigations into abuse of dominance and cartels per year, and Remedies is the log of the number of abuse of dominance and cartel investigations that resulted in remedies.³⁰ Figure 9 plots the

²⁷ We tried to collect the same data from each jurisdiction, but not all agencies provided information about all variables or data for all relevant years. In addition, some agencies provided additional or slightly different information than what we requested. Our data set thus does not have complete coverage for all country-years for which we obtained data. Moreover, the data coverage is sparser earlier in the 1990s than in the 2000s. For instance, we are missing budget data for 462 country-year observations from 1990 to 1999 and for 334 observations from 2000 to 2010.

²⁸ When collecting data on budgets, we asked the agencies vested with multiple responsibilities (such as consumer protection and antitrust law) to report only the budget dedicated to antitrust enforcement. We divide the natural log of the budget by the natural log of the country's budget to account for differences in market size.

²⁹ As with budgets, when collecting data on staff numbers, we asked the agencies vested with multiple responsibilities to report only the staff dedicated to antitrust enforcement.

³⁰ We exclude merger data when calculating the number of investigations and remedies because firms' merger activity may be completely exogenous to the agency. However, the results are robust to including merger data in these variables.

Figure 9. Antitrust enforcement resources and activities, 2010

Table 6
Trade Openness and Antitrust Enforcement Resources and Activities

	Reduced Form			Two-Stage Least Squares		
	(1)	(2)	(3)	(4)	(5)	(6)
Budget:						
PTSH	.379** (.085)	.192* (.084)	.208** (.072)			
Trade Openness				1.065** (.314)	.671* (.329)	1.791 (1.145)
Staff Size:						
PTSH	1.240** (.292)	.601* (.281)	.757** (.242)			
Trade Openness				3.487** (1.002)	2.089* (1.034)	6.484 (4.082)
Investigations:						
PTSH	.718** (.180)	.372* (.173)	.219 (.207)			
Trade Openness				2.020** (.626)	1.300+ (.660)	1.892 (1.967)
Remedies:						
PTSH	.311** (.114)	.096 (.108)	.211+ (.109)			
Trade Openness				.866** (.331)	.331 (.363)	1.802 (1.254)
Region dummies	No	Yes	Yes	No	Yes	Yes
Time trend	No	No	Yes	No	No	Yes
Country fixed effects	No	No	Yes	No	No	Yes

Note. The dependent variables are from the antitrust enforcement data set. Robust standard errors clustered by country are in parentheses. All regressions include controls for population and area. The first-stage instrument is PTSH.

+ $p < .1$.

* $p < .05$.

** $p < .01$.

values for these variables for each country as of 2010. Although there is variance among variables, all four are positively correlated with countries' CLI scores.³¹

Table 6 reports regressions using the four variables from 1990 to 2010 as the dependent variable. The regressions largely recreate the specifications from Tables 3 and 4, but given possible fluctuations in enforcement resources and activities from year to year, columns 3 and 6 include country fixed effects. All of the coefficients for the trade measures are positive, and 17 of 24 of the relationships are statistically significant at the .1 level or higher.³² The results are especially in-

³¹ In 2010, the correlations with CLI for the variables are Budget = .47, Staff Size = .49, Investigations = .38, and Remedies = .35.

³² The fact that the results are not consistently statistically significant may be due to measurement error as a result of missing values in the dependent variable. We exclude observations for which we were unable to collect data for the dependent variable. However, the results are substantially the same when we include those observations while coding their values as 0 and including a dummy variable for observations for which the data are missing.

Figure 10. Predicted trade and antitrust enforcement

teresting considering the results in Section 6 documenting that the positive relationship between trade openness and the stringency of antitrust laws waned after the 1990s. However, Table 6 suggests that enforcement resources and activities remained positively correlated with exposure to trade during 1990–2010. For those who believe that enforcement is a better measure of stringency than law on the books, this may be the strongest evidence yet that increased trade openness is associated with countries adopting and maintaining more stringent antitrust regimes.

To further explore why we still find a positive correlation between trade openness and antitrust enforcement for 1990–2010, we recreate our regressions for the two subsamples in Figure 6, that is, excluding late adopters and excluding early adopters. Figure 10 presents binned scatterplots using the regression specifications from column 6 of Table 6 for these subsamples. The results in Figure 10 suggest that the correlations between predicted trade shares and the measures of antitrust enforcement resources and activities are weakly positive. However, although the coefficients of interest are consistently positive when running the full set of regression specifications from Table 6, they are not consistently statistically significant. The results are inconclusive but are noticeably different from those in Figure 6. Thus, taken together, the results in Section 6 suggest that late adopters

may have adopted antitrust laws that did not correspond to their trade openness, but the results in this section suggest that countries with greater exposure to trade may be more likely to dedicate resources and pursue cases to enforce those laws.

8. Conclusion

We use new comparative antitrust data to test whether countries with greater trade openness also have more stringent antitrust regimes. When instrumenting for trade openness using predicted trade flows, we find a positive and statistically significant relationship between trade openness and countries' antitrust laws. Our results are largely consistent when using alternative methods for measuring antitrust stringency and trade and when introducing additional data sets that more comprehensively measure countries' antitrust regimes.

We leave several important questions for future research. First, our results do not settle the theoretical debate over whether countries that exhibit trade openness benefit from having more stringent antitrust regimes. High levels of trade openness and strict antitrust regimes may complement each other and create more competitive markets, but stringent antitrust regimes may be redundant once a country is exposed to trade. Future research should test the effect of the relationship between trade openness and antitrust stringency on market outcomes.

Second, our results do not explore why countries with greater trade openness are likely to have also adopted more stringent antitrust regimes. Countries may be pursuing the strategies together to promote more competitive markets. However, with increasing trade liberalization, domestic firms may urge the government to employ antitrust policy in ways that allow them to obtain protection from foreign rivals (Guzman 1998; Baumol and Ordover 1985). For instance, Dixit (1984) notes that trade liberalization is commonly thought to invite domestic mergers and limit foreign entry in an effort to help domestic industry withstand competition. Similarly, Bond (2013) argues that large economies that can affect world prices may use trade and antitrust policies strategically to manipulate the terms of trade in their favor.

In addition to these theoretical arguments, there are a few empirical studies that suggest that countries may use antitrust policies to protect domestic firms from foreign competition. For instance, Shughart, Silverman, and Tollison (1995) study US antitrust enforcement budgets prior to 1981 and find a positive correlation between the level of imports and antitrust enforcement budgets for the Department of Justice and the Federal Trade Commission, which they interpret as evidence of antitrust regulations being leveraged to counter foreign competition. In addition, Özden (2005–6) examines 209 mergers in the EU from 1995 to 1999 involving at least one US firm and finds that more extensive review of a merger is likely if the target is European or if all US firms in the industry have high market share. This, Özden argues, signifies a political and economic tendency to protect European firms. Finally, Cremieux and Snyder (2016) study cartel enforcement

by the EU and the United States and find that the United States levies significantly higher fines on foreign firms than domestic firms.

However, others question any systematic use of antitrust law for protectionist purposes, noting that antitrust regulation is a blunt instrument to manipulate trade flows (Bradford 2007). For instance, Bradford, Jackson, and Zytneck (2018), a study on EU merger control in 1990–2014, contradicts the finding of Özden (2005–6). Using data covering over 5,000 mergers, Bradford, Jackson, and Zytneck (2018) find no evidence that the European Commission intervenes more frequently or more extensively in mergers involving foreign acquirers. Thus, the debate over whether the surge in antitrust regimes in the presence of open trade is a sign of countries' steadfast commitment to market competition or, alternatively, economic protectionism moving from traditional trade instruments to antitrust instruments remains unresolved.

These results provide new evidence about the relationship between international trade and antitrust policy. Yet research on the relationship between trade and antitrust law should not end here. We hope that our project will spark new empirical investigations about whether protectionism can migrate from trade policy to antitrust policy as a result of trade opening and about how these two policy tools can best be used to promote competitive markets and economic growth.

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