

Does Antitrust Policy Promote Market Innovation and Competitiveness?

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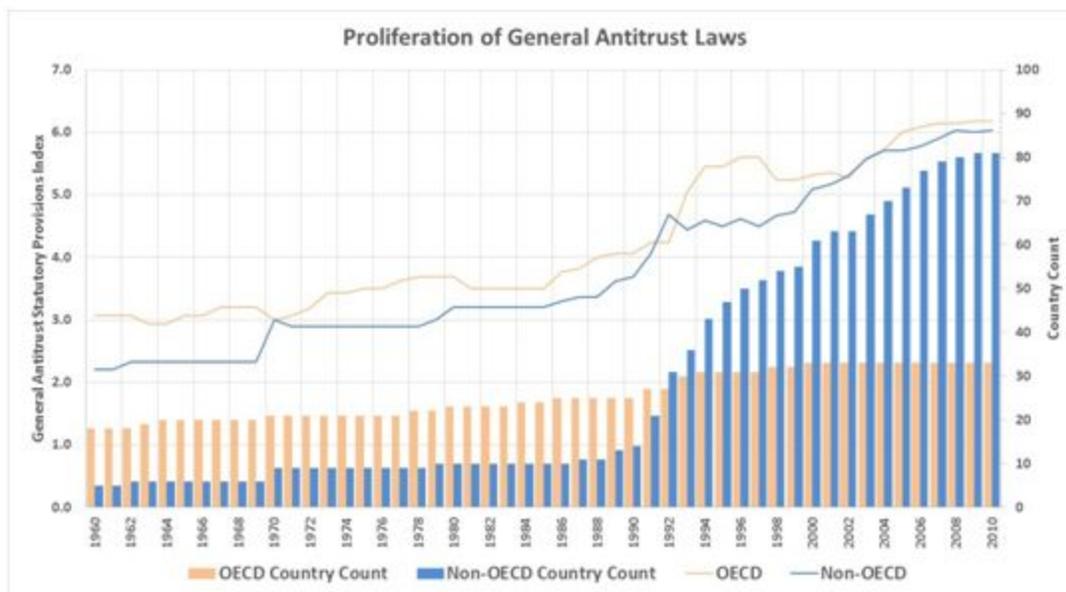
Abstract

Over the past three decades, antitrust laws have proliferated across the globe. International institutions and governments have promoted antitrust policy as an important regulatory tool to enhance economic performance. At the same time, we have scant empirical evidence on whether these policies actually work. Do they foster market competition, with the ensuing benefits of greater efficiency, economic prosperity and innovation? In other words, is the adoption of these antitrust laws good public policy and an efficient use of scarce public resources? Our research seeks to provide a theoretical and empirical foundation to these questions. We develop a novel dataset on antitrust laws and enforcement across time and jurisdictions that accounts for political and institutional nuances, and link these variables to patent data. This enables us to construct robust measures quantifying antitrust regimes and, for the first time, systematically test alternative hypotheses on the impact of antitrust policy on innovation. While our research focuses on antitrust policy, this project provides an analytical foundation for thinking about the determinants of regulatory policies and their relative ability to contribute to more innovative and competitive markets and, ultimately, to greater social welfare.

I. Introduction

Antitrust laws, which constrain monopolies and prohibit cartels and other forms of anticompetitive behavior in markets, have, over the past three decades, spread from some 30 countries to approximately 120 countries across the globe, as illustrated in Figure 1. The World Bank, the International Monetary Fund (IMF), the European Union (EU), the United Nations Conference on Trade and Development (UNCTAD) and the Organisation for Economic Co-operation and Development (OECD) have all encouraged governments to enact such laws and to devote substantial resources to their enforcement. The adoption of a domestic antitrust law has frequently been a requirement for a loan or other financial assistance by the World Bank or the IMF as well as the *sine qua non* for securing a preferential trade agreement with the EU. Notwithstanding the conviction with which these policies have been promoted, we have limited empirical evidence evaluating whether these policies actually work. Do they foster market competition with the ensuing benefits of greater efficiency, economic prosperity, innovation, and enhanced political and economic freedom? In other words, is the adoption of such laws good public policy and an efficient use of scarce public resources in both developed and emerging markets? Our research seeks to provide a theoretical and empirical foundation for this key policy question.

Figure 1



Efficiency is conventionally thought of as the primary goal of antitrust law--whether defined as the maximization of consumer welfare or total welfare. However, many countries have adopted antitrust laws with a much broader set of goals in mind. In South Africa, for example, an antitrust law passed in 1998 emphasizing the objectives of undoing the “excessive concentrations of

ownership and control” created along racial lines by the “apartheid and other discriminatory laws and practices” and “balancing the interests of workers, owners, and consumers” for the “benefit [of] all South Africans.”¹ In 1998, Fiji enacted a Commerce Act that aimed to “balance ... efficiency and environmental and social considerations” and “ensure non-discriminatory access to monopoly ... infrastructure or services.”² Antitrust statutes rarely identify innovation as an explicit goal of antitrust law. Our research suggests that only Kenya (2010), New Zealand (2008), The Netherlands (1993) and Tanzania (2000) have adopted an antitrust law containing such a reference. However, “efficiency” as a stated goal may be thought to accommodate dynamic efficiency as well. References to innovation are also likely to be more commonly found in various guidelines and other non-binding instruments that antitrust agencies promulgate to clarify their enforcement policies and priorities. For instance, the 2010 US Horizontal Merger Guidelines stipulate:

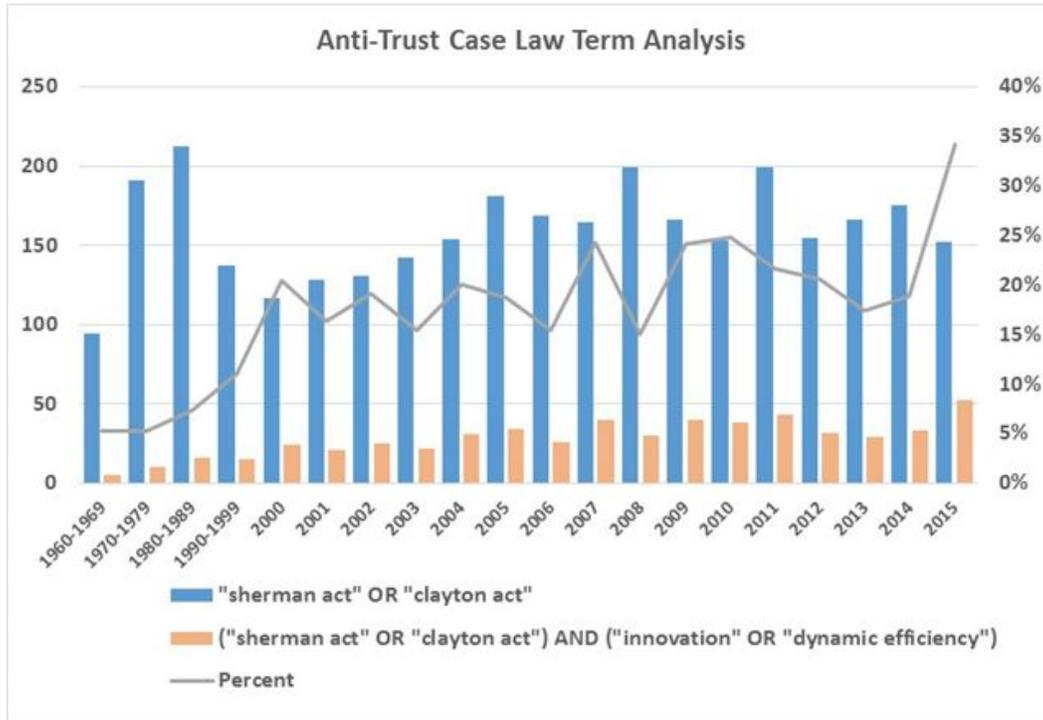
“Competition often spurs firms to innovate. The Agencies may consider whether a merger is likely to diminish innovation competition by encouraging the merged firm to curtail its innovative efforts below the level that would prevail in the absence of the merger. That curtailment of innovation could take the form of reduced incentive to continue with an existing product-development effort or reduced incentive to initiate development of new products.”

The old 1992 Merger Guidelines did not address the innovation effects. A similar trend towards growing acceptance of innovation as a goal of antitrust law emerges from our cursory examination of US courts’ antitrust rulings. US courts increasingly invoke “innovation” and “dynamic efficiency” as justification in their antitrust decisions and rulings, suggesting that the promotion of innovation and dynamic efficiency is today seen as a key goal (or outcome) of a robust antitrust regime. In the 1960s, only 5% of the antitrust judgments by US courts made a reference to “innovation” or “dynamic efficiency.” This figure increased to 15% by 2000 and to 35% today. This speaks for a growing recognition of innovation as an important consideration informing antitrust policy.

¹ *Competition Act, 1998*, Southern African Legal Information Institute, http://www.saflii.org/za/legis/num_act/ca1998149.pdf (last visited July 10, 2015).

² *Commerce Act 1998*, Pacific Islands Legal Information Institute, http://www.pacii.org/fj/legis/num_act/ca199888/index.html (last visited June 9, 2015).

Figure 2³



As an empirical matter, evidence on the impact of antitrust regimes on market outcomes is mixed. One of the key challenges has been the absence of rigorous measures of antitrust laws and their enforcement. Most existing studies have sought to measure the causatum of these laws by merely identifying whether a given country has an antitrust law in place. Yet this method ignores significant variation in the scope and content of antitrust laws as well as the divergence on how they are enforced. Moreover, the design and ultimate efficacy of these laws reflect underlying economic and political conditions as well as varying institutional environments.

We propose to address this gap in the literature by developing a novel dataset on antitrust laws and enforcement across time and jurisdiction and analyzing these data in their nuanced political and institutional context. This allows us to capture the variation of antitrust regimes and, for the first time, seriously test alternative hypotheses on the impact of antitrust policy on economic performance and innovation. Specifically, we can test whether these laws have a statistically significant effect on key dependent variables, such as competitiveness, the intensity of competition on markets, industry markups, the level of foreign direct investment or innovation and on measures of overall economic performance, such as growth in total factor productivity or

³ This chart presents search results across U.S. Federal and State court decisions for the term combinations listed in the legend. All State & Federal, WestSearch, <http://www.next.westlaw.com> (last visited Nov. 6, 2015). The results for the four, decade-long periods are annualized for ease of comparison. The data confirms a clear increase in percent of cases referencing antitrust issues that also discuss “innovation” or “dynamic efficiency.”

real per capita gross domestic product (GDP). This paper is the first in a series of papers measuring the effect of antitrust policy on market outcomes, focusing specifically on the relationship between antitrust laws and innovation. To measure innovation, we use data on patent applications filed with the USPTO, accounting for their importance by weighing each patent by its combined citation count.

Ultimately, this research will help us understand not only whether these laws are beneficial but also provide insights as to which elements of these laws or enforcement actions have the greatest impact on economic growth, competitiveness and innovation. Most importantly, we can test how optimal policy design varies depending on the country's level of development, the maturity of its antitrust regime and existing governance infrastructure, as well as other key institutional (economic and political) variables. Our motivating hypothesis is that because of the endogenous nature of these institutional arrangements, different combinations of policy features will work better under different conditions.

The paper is organized as follows. The next section briefly reviews the scant literature on the effects of antitrust laws on various market performance indicators, including innovation. In Section III, we build off the new political economy literature of regulatory design and describe our key hypotheses as well as the empirical strategy to test them. We then outline the data collected, and provide initial trends on the relationship between these laws and innovation.

II. Antitrust, Market Competitiveness and Innovation

The existing research on the effects on antitrust policies is scarce and inconclusive. While there is near-consensus that *competition* enhances welfare, there is no such consensus on whether *competition policy* is beneficial. Some economists argue that antitrust intervention in the operation of free markets makes societies worse off. This is due to the difficulty governments have distinguishing healthy competition from anticompetitive behavior and because of the underappreciated power of markets to keep anticompetitive practices in check (Crandall and Winston 2003). Other economists contest this view, emphasizing the deterrent effect of antitrust laws and the positive net impact that antitrust policy has on social welfare as a result (Baker 2003; Werden 2003).

Similarly, some authors of empirical research find that antitrust laws have significant impact on economic performance indicators while other studies contest these findings. There is also disagreement on whether antitrust policies have a greater impact on developed as opposed to developing countries and whether laws on the books or investment in enforcement infrastructure yield better outcomes. We discuss the key findings in the literature below.⁴

⁴ For a comprehensive review of the literature, see Buccirosi, Ciari, Duso, Spagnolo and Vitale (2011).

2.1 Antitrust and Market Performance

There have been several attempts to measure how antitrust policy impacts economic performance. Gutmann and Voigt (2014) find that the introduction of competition laws is correlated with an increase in annual growth rate. Yet they find no correlation between competition laws and total factor productivity. Petersen (2013) finds that antitrust law has a significant effect on economic development (measured by GDP per capita and average rate of economic growth), but only after an antitrust regime has been in place for 10 years. Dutz and Hayri (1999) find correlation between effective antitrust policy and growth in South America and many European countries, but discovered that this correlation breaks down amongst the Asian Tigers.

One disagreement among scholars relates to how antitrust policy impacts countries at different income levels. When comparing the effect of competition policy on low- and high-income countries, Gutmann and Voigt (2014) find that introducing antitrust law boosts investment and decreases corruption, but only in low-income countries. In contrast, Ma (2011) finds that emerging markets benefit less from a strong antitrust policy than highly developed countries. Ma tests whether antitrust laws and general “government effectiveness” enhance the average annual growth rate of productivity (real GDP per worker). He finds no statistically significant relationship between this competition/enforcement variable and economic growth for poor countries, but shows that a positive and significant correlation exists in rich countries.

Several scholars have compared the relative effects of antitrust laws and enforcement institutions on market outcomes. Hylton and Deng (2007) find that the “scope” of a country’s antitrust law is positively correlated with the intensity of competition. At the same time, the authors find no statistically significant correlation between the antitrust agencies’ enforcement budget relative to GDP or the existence of a competition agency and increased competition intensity. This is contrary to Ma’s (2011) finding discussed above. Clougherty (2011) also finds a positive and significant correlation between budgetary resources devoted to antitrust policy and annual growth of per-capita GDP. Some other studies also suggest that enforcement and institutions matter, i.e. that antitrust policy is less effective in countries with less efficient legal institutions (Buccirossi, Ciari, Duso, Spagnolo and Vitale (2011)). Other studies are more mixed in this regard: Voigt (2006) finds that the *de facto* independence of an antitrust agency is positively correlated with an improvement in total factor productivity. However, his finding is no longer robust when he includes measures of the general quality of institutions and the effectiveness of the government.

2.2. Antitrust and Innovation

Turning specifically to the relationship between antitrust policy and innovation, the existing theoretical and empirical literature is similarly inconclusive. Existing theoretical literature on the relationship between competition law and innovation is wide-ranging but indeterminate. Empirical research on the relationship between antitrust policy and innovation is almost nonexistent. It is little contested that antitrust laws, when properly drafted and enforced, can enhance efficiency and increase consumer welfare. Vigorous antitrust policy can keep prices and output high, thereby promoting static efficiency. It is more debated whether antitrust laws are able to foster dynamic efficiency and, hence, spur companies to develop and bring new innovations in the market.

The key policy question focuses on the amount of market power antitrust laws should allow in order to create or preserve incentives for innovation. The debate often starts by contrasting the arguments made by Schumpeter (1942) and Arrow (1962). Schumpeter famously argued that the prospect of market power and ensuing monopoly rents spur innovation. Arrow challenged this view, arguing instead that monopolists have an interest in preserving the status quo and less to gain from innovating. According to him, competition incentivizes firms to innovate. In the same vein, Tirole (1997) suggested that the monopolist is likely to hold back innovation because of the “replacement effect”—the idea that innovation would only replace a monopolist’s existing rents. Several commentators today have declared the debate over, concluding that Arrow has won and maintaining it well established that competition promotes innovation (Priest 2011 and Baker 2007). Others claim that the two views are, in fact, compatible (Shapiro 2012). If there is a prevailing view today, it seems to be that neither oligopolistic market structure nor highly competitive markets provides the most fertile environment for innovation, but that, on balance, competitive market structures are more fostering of innovation than the existence of monopolies or cartels (Motta 2004). This would suggest that optimal antitrust law would also strike the middle ground, allowing for vigorous enforcement but recognizing that all monopolies and all concentration is not evil. Yet this observation rests on an uncertain foundation since a large number of scholars continue to view the debate ultimately largely unsettled (Gilbert 2006; Motta 2004; Davis 2003).

There are reasons to expect that antitrust laws and their enforcement positively affect incentives to innovate (Baker 2007; Shapiro 2012, Priest 2011). Antitrust laws prohibit collusion between rivals, exclusionary practices by dominant companies or mergers between competitors, among others. They encourage entry and rivalry, which creates incentives for firms to find ways to reduce costs, improve product quality or develop new products to increase their profits. Innovation is therefore a way to get ahead of rivals. There is also significant empirical evidence showing that companies that are shielded from international competition fall behind and lose

their ability to compete because of the missing rivalry that would have driven them to innovate (Porter 2001). The influential paper by Aghion et al. (2005), discussed above, finds an inverted U-shape relationship between competition and innovation. This does not prevent one of the authors of that study, Peter Howitt (2004 and 2007), from concluding that “a strengthening of competition policy is likely to have a positive overall effect on innovation.”

The arguments to the contrary rest on the idea that innovation is costly (Schumpeter 1942). R&D is a fixed cost and often easier to fund if the resources are already within the firm. Large firms, therefore, usually have the greater ability to innovate, the argument goes. If they can also better protect their investments in R&D post-innovation due to their significant market power, the incentives to innovate should increase. Mergers can lead to greater innovation because the larger firm and market size increase the firm’s ability and incentive to invest in R&D. Mergers can also have a positive effect on innovation if the merging firms are able to achieve synergies by combining their R&D activities (Katz and Shelanski 2007). This line of reasoning argues for the loosening of antitrust policy as a way to maximize firms’ incentives (and resources) for innovation.

Most commentators seem to agree that the relationship between competition and innovation is complex. Aghion et al. (2005 and 2009) find that there is an inverted-U shape link between competition and innovation, with too little or too much competition reducing innovation. This inverted U-shape relationship holds if competition is measured by several indicators, such as mark-ups (2005) or foreign entry (2009). In their research, Aghion et al. measure innovation with patent data. However, Dutz et al. (2011) do not find any statistically significant effect on proxies of competition at the firm level, such as number of domestic and foreign competitors, level of R&D investment, product and process innovation and TFP.

Several other studies suggest that there is a non-linear relation between competition and innovation which can be influenced by several factors. According to Aghion et al. (2005 and 2014), the existence of a technological gap and the type of industry matter. The authors use the Lerner Index (price cost margin) as the main indicator of competition and the average number of patents taken out by firms in an industry as the primary indicator of innovation. They find that competition encourages neck-and-neck firms (i.e., firms operating at identical technological levels or at a technology frontier) to innovate but has the opposite effect on technological laggards. Schmutzler’s theoretical paper (2010) reaches similar results. He develops a model to show that a positive effect of competition on R&D investments is more likely for leaders than for laggards. Vivès (2008) shows that the impact of competitive pressure on innovation depends on the type of innovation considered (process or product innovation) and on the cause of the

increase in competition (increase in the number of competitors, greater product substitutability, increase in market size, reduction in entry barriers).

Empirical research on the effect of competition *policy* on innovation is almost nonexistent.⁵ Marinova et al. (2005) is a rare study focusing on the effect of antitrust enforcement on innovation. The study finds that higher levels of civil antitrust enforcement actions of the U.S. Department of Justice lead to a significantly higher number of patent filing during the following year. By contrast, using DoJ Antitrust Division expenditures as a policy indicator and relying on a VAR-model of labor productivity, Young and Shughart (2010) find that antitrust enforcement has a negative effect on productivity growth, which they associate with an adverse (temporary) reduction in innovation.

2.3 Measuring Competition vs. Competition Policy

As the above references suggest, most of the existing empirical work seeks to model and measure the relationship between *competition* and innovation. They rely on the Lerner Index or some variations thereof to measure whether markets are competitive, and proceed to test whether competition positively correlates with innovation. In these studies, low degree of product differentiation or low levels of market concentration often serve as proxies for market competition whereas R&D expenditures or patent filings are used to capture the rate of innovation. Our goal is related but ultimately different. We do not directly seek to measure the relationship between competition and innovation. Instead, our focus is on the relationship between competition *policy* and innovation. Our interest is therefore to test whether the policy measures—specifically *competition laws and their enforcement*—adopted and pursued by governments actually spur innovation. This is motivated by our broader desire to understand whether these laws are effective. These different independent variable measures are obviously related to the extent we believe that antitrust laws facilitate competitive markets. There are theoretical arguments supporting that case, but that is a separate empirical question that we will take on directly in another paper.

Measuring competition policy, as opposed to competition as such, has some advantages. Economists have recognized that the degree of product market concentration is a “highly imperfect” measure for competition (Gilbert 2006). Theoretically, it is difficult to defend an assumption that low levels of concentration would always be desirable. Firms differ in their

⁵ Most studies on regulatory regimes focus on the effect of general regulatory policies (rather than competition law per se) on innovation. For instance, Bourles et al. (2013) find that increasing competition in upstream sectors by completely eliminating anti-competitive regulations would increase multifactor productivity growth by 1 to 1.5% per year in the observed 15 OECD countries from 1984 to 2007. Winston (1993) examines the effect of regulatory reform and mentions that economic regulation (e.g., regulation of pricing, entry and exit) restrict firms’ operations and thus create dynamic inefficiencies as indicated by low productivity growth, slow technological innovation, and poor management quality.

efficiency and productivity levels (Bartelsman and Doms 2000). Scale economies also suggest that it is sometimes efficient to have a market structure with fewer firms all possessing substantial market shares (Shapiro 2012; Demsetz 1973). Low degree of market concentration, therefore, tells us only so much about the competitiveness of any given market. Measuring the strength and direction of antitrust policy identifies regulatory environments that, if properly enforced, create and preserve competitive markets that accommodate varying degrees of product-differentiation or market concentration. It also allows us to pursue cross-national studies, with the benefits and drawbacks that such studies entail.

2.4. Shortcomings in the Existing Literature

Until today, the few studies measuring the effect of antitrust policy on market outcomes have been of limited value. The fundamental limitation of the existing scholarship stems from the absence of reliable methods to measure the stringency of countries' antitrust laws or enforcement. Reliance on small samples (Kee and Hoekman 2006; Buccirossi, Ciari, Duso, Spagnolo and Vitale (2011) or aggregate indicators (Ma, 2011; Borrell and Tolosa, 2004) compromise the accuracy of any conclusions drawn from the analysis. Coding for the mere existence of antitrust laws (Gutmann and Voigt, 2014; Petersen, 2013) with binary variables has been the industry standard. Any measurement of enforcement has relied on enforcement budgets alone (Clougherty, 2011) without linking specific antitrust provisions to relevant outcome variables or accounting for variation in the types of enforcement actions (Hylton and Deng, 2007). These metrics provide limited information on what types of antitrust regimes are most effective and under what conditions. These approaches, therefore, offer insufficient guidance for the optimal design of antitrust laws.⁶

A second weakness is that measures of antitrust laws fail to differentiate the impact of alternative policy instruments, decision-making criteria, and administrative procedures defining the scope of agency action, as well as available resources (budgets and staff), on the implementation and enforcement of these policies. The delegation of discretionary authority to administrative agencies, however, reflects the political and economic dynamics at play.⁷ Therefore, we

⁶ Hylton and Deng (2007) adopt a more comprehensive approach by coding different features of substantive antitrust laws across countries and time. Nonetheless, their analysis contains serious omissions and limitations: first, the dataset has notable gaps in the coverage of the laws included; and second, they omit important amendments, sector specific regulations and laws that are not readily available in English. These (non-random) omissions risk introducing a serious bias into the analysis. The most notable omission, however, is the authors' focus on laws-on-the-books only. Any study of the statutes alone is subject to the criticism that a substantial gap may exist between the laws countries adopt and their enforcement practices, and this gap may vary across countries and over time. According to the authors, the current antitrust laws of Barbados, Belarus, and Malawi, for instance, are on paper among the most stringent in the world. Yet, there are good reasons to doubt whether enforcement practice in these countries is at all comparable.

⁷ This line of argumentation is articulated in McCubbins and Schwartz (1984), McCubbins, Noll and Weingast (1987; 1989) and Epstein and O'Halloran (1994).

highlight the endogenous nature of competition law and its ensuing impact on competitiveness and innovation.

A third limiting factor is that policy claims are not derived from an analytical framework yielding empirically testable hypotheses. This failure is important for two reasons: First, the causal mechanism by which antitrust laws impact market outcomes is undefined; and second, predictions gleaned from theory necessarily inform the research design adopted and the subsequent indicators constructed. Therefore, assertions evaluating the impact of antitrust laws on innovation remain unvalidated; neither the data collected nor the variables measured are sufficiently specified to determine the sign and magnitude of the underlying causal relationship. For example, it may be true that independent agencies implementing and enforcing complex antitrust laws work well in advanced democracies, characterized by well-functioning courts, competitive elections, free press, and effective legislative oversight. However, in newly forming democracies, which lack many of these traits, agency independence may have the opposite effect. Ultimately, we seek to advance the literature by responding to all these shortcomings. For now, we are able to take the first set of steps in that direction and share tentative results based on our initial analysis.

III. Theory and Research Design

The prevailing view is that antitrust regulation is one of the most powerful tools to shape the structure, operation, and distribution of the benefits of a market economy (Fligstein 1990; 2001; Gerber 2010). Antitrust laws seek to ensure sufficient competition in the market to the benefit of consumers by permitting government intervention against cartels and anti-competitive mergers, as well as the abuse of market power by dominant companies. Thus, the theory goes, antitrust laws enhance national welfare by contributing to more robust, competitive markets.

While this theory is widely endorsed, the actual effect of these laws has not been subjected to rigorous empirical testing thus far. Antitrust laws undoubtedly have the potential to significantly contribute to economic welfare and competitiveness. Nonetheless, we challenge the notion that antitrust laws are inherently effective. Instead, we argue that the efficacy of antitrust regimes depends on endogenous factors. Consequently, we need to disentangle these effects to define what constitutes “optimal antitrust policy” within the political and economic context that the policy is designed to operate.⁸

⁸ An extensive body of literature examines the political and economic determinants of regulatory design. This work highlights political conflict, institutional capacity, and downstream risks between the regulator and market participants to explain both the stringency of the antitrust laws as well as the efficacy of enforcement. For example, Epstein and O'Halloran (1999) show that agency design, the amount of discretionary authority delegated to regulators to set policy, reflects political conflict and policy uncertainty. This tradeoff between information gains and distributive losses are further elaborated in a series of studies examining the politics of delegation with an executive veto (Volden, 2002) and executive review of proposed regulations (Wiseman, 2009).

We acknowledge the complexity of the theoretical debate on the relationship between competition and innovation. Yet in our examination of antitrust policy, we make several assumptions, building in particular on the arguments advanced by Shapiro on the importance of rivalry and contestability of markets when measuring the ability of antitrust policy to foster innovation. Rivalry describes competitive process as opposed to outcome. Contestability refers to the degree to which a firm can gain profitable sales from its rivals and the ease of market entry and exit. We assume that antitrust laws that foster *rivalry* and ensure *contestability* of markets generally create conditions that maximize innovation. Such laws are geared to foster competition by protecting the ability of each market player, whether existing or entering, to win future sales from its rivals by virtue of superior efficiency and innovation. To ensure this, laws in place need to be sufficiently comprehensive and stringent, as well as guided by sound economic principles. We have developed an Antitrust Stringency Index to measure the stringency of antitrust laws across countries, and an Antitrust Specificity Index to measure the level of detail (delegation) of these same laws.

We further measure the economic soundness of antitrust laws through a separate index, distinguishing across provisions that reflect efficiency (as opposed to non-economic) considerations. We also take the view that the laws need to be enforced with sufficient resources and expertise, as laws in books alone do little to preserve rivalry and ensure contestability. We expect to have a wide variety of enforcement metrics available for analysis soon, allowing us to measure actual enforcement practice. We further expect that laws that reflect prevailing political climate rather than economic considerations are less capable of generating conditions for rivalry and contestability. To proxy this, we measure the extent to which laws contain exemptions for certain industries--another metric that will be included in the analysis at its next stage.

While we are only able to proceed with highly incomplete empirical analysis at this stage, we explain below a broader set of hypotheses that we have developed and will be later testing. Specifically, we expect stringent antitrust laws and high level of enforcement to lead to more robust competition and greater innovation only in the presence of well-functioning democratic institutions, which ensure a minimum level of commitment to the rule of law, transparency and institutional effectiveness (*Stringency Principle* and *Enforcement Principle*). We also expect that more specific laws which effectively constrain agency discretion lead to greater market performance, including higher levels of innovation. Constraining the agency's leeway in its enforcement decisions reduces the risk of agency capture, with ensuing benefits of greater innovation (*Specificity Principle*). However, we recognize that all agencies are not equally prone to capture and therefore likely to use their discretion in a way that reduces competition and innovation. Antitrust laws that give agencies significant discretion to incorporate their expertise

when setting policy and to flexibly respond to changing conditions may also lead to better regulated markets.

We also expect antitrust laws to be effective only when their adoption is driven by a genuine domestic political commitment to their implementation and enforcement. Countries that have adopted laws due to external pressures (including as a condition for a loan or a trade agreement) are less likely to devote the resources for their effective implementation. In other words, externally imposed laws on the books—however stringent and comprehensive—do little to advance competitiveness if those laws are not internalized by the relevant stakeholders (*Commitment Principle*). We expect this domestic commitment to manifest itself through establishment of independent and adequately resourced as well as experienced antitrust agencies (*Commitment Principle* and *Capacity Principle*).

Antitrust laws are likely to be effective only after they have been properly entrenched in the legal and economic infrastructure of the country (*Capacity Principle*). In other words, the same law and enforcement resources will likely not enhance competitiveness when measured only two years, as opposed to ten years, after the law's enactment and the establishment of the agency. We further expect laws with clear and narrow goals (such as consumer welfare as opposed to a long list of mixed policy objectives) and a minimum number of exceptions for various industries to lead to more competitive markets and greater innovation (*Favored Industry Principle*). Similarly, especially for new and developing antitrust jurisdictions, narrowly tailored laws and focused enforcement efforts are likely to yield better results than complex laws that are harder to enforce (*Complexity Principle*).⁹ Finally, we expect laws that are motivated by economic considerations to have a more positive effect on market outcomes, such as innovation, than laws that reflect multiple goals, including wider considerations of public interest (*Economic Soundness Principle*). Table 1 summarizes these arguments as a series of empirically testable hypotheses regarding the impact of antitrust policy on market competitiveness, across countries and over time. In this early draft, we will focus on developing and testing the *Stringency* and *Specificity Principles* across a small subset of countries that are ready for the analysis.

Table 1: Hypotheses on Antitrust Laws and Innovation

⁹ For instance, rules banning abusive practices by dominant companies are difficult to enforce due to more complicated economic assessments needed to build the case as well as the expected political resistance by these large enterprises. Such rules are thus likely to be effective in more established and developed jurisdictions, only.

Hypothesis	Description	Dep. Variable	Ind. Variable
<i>Capacity Principle</i>	Greater resources and expertise of a bureaucracy to implement and enforce antitrust laws leads to greater innovation	Citation-weighted patents	Budget and professional civil service, accumulated agency experience/years (expertise) (+)
<i>Complexity Principle</i>	Given well-resourced and experienced agencies, complex policy instruments lead to more competitiveness and innovation. Otherwise, the impact of complex laws on competitiveness and innovation is indeterminate/negative	Citation-weighted patents	Antitrust Index if adequate resources (budget and professional civil service) (+)
<i>Commitment Principle</i>	Given well-functioning democratic institutions, externally imposed antitrust laws lead to less commitment to competitive markets an innovation.	Citation-weighted patents	External Requirement, (Stringency - Enforcement) (-)
<i>Favored Industry Principle</i>	Antitrust laws that exempt market participants from enforcement will lead to less innovative markets.	Citation-weighted patents	Industry Exemptions (-)
<i>Stringency Principle</i>	Given well-functioning democratic institutions, more stringent antitrust laws lead to more innovative markets. Otherwise, the impact of policy stringency on innovation will be indeterminate or even negative.	Citation-weighted patents	Stringency of laws, if Democracy (+)
<i>Specificity Principle</i>	Given well-functioning democratic institutions, more specific (less discretionary) antitrust laws lead to more innovative markets. Otherwise, the impact of specificity on innovation will be indeterminate or even negative.	Citation-weighted patents	Specificity of laws, if Democracy (+)
<i>Economic Soundness Principle</i>	Antitrust laws that reflect economic considerations, only, lead to more innovation.	Citation-weighted patents	Economic Soundness Index (+)
<i>Enforcement Principle</i>	Given well-functioning democratic institutions, the more enforcement of antitrust laws leads to more innovation.	Citation-weighted patents	Enforcement actions, if Democracy (+)

IV. Data and Methods

To test the above hypotheses on the link between antitrust policy and market competitiveness, we compile a comprehensive database of *antitrust laws* in 119 countries since their adoption (with most countries entering into the dataset in the last 30 years). This represents the entire universe of countries that adopted antitrust laws by 2010. Recognizing the inherent gap between laws in the books and laws in action, we complement our data with extensive input and output measures of *antitrust enforcement* for a large panel of both developed and developing countries since 1990¹⁰ Our data gathering of laws and enforcement measures builds on the most ambitious and comprehensive dataset on world antitrust regimes, which Anu Bradford has developed to an advanced stage with the help of funding from the National Science Foundation (NSF).¹¹

4.1 Cross-National Antitrust Database

Two iterative processes define the data extraction and coding method.¹² The first step in the manual coding process is locating and downloading the document sources from available websites. In the next step, annotators collect metadata (*e.g.* country, year, past year) regarding a country's antitrust laws for a given year. The annotators then populate the relevant data fields by answering a series of Yes/No questions in a Qualtrics¹³ survey related to substantive statutory provisions as well as legislative goals, legal traditions, and exemptions from current antitrust laws. The following step checks for intercoder reliability, employing a second annotator to repeat the above process independently. Any discrepancies are resolved by a third, senior annotator. Detailed coding rules for antitrust laws are provided in Appendix 1.¹⁴

Our dataset includes 119 jurisdictions—every jurisdiction that had adopted a domestic antitrust law by 2010. The coding goes back to the first law impacting antitrust policy adopted in each jurisdiction. Three of those jurisdictions consist of regional organizations, including the EU, which exercise supranational antitrust jurisdiction over several countries. We have coded not only general antitrust laws but also other business laws or regulations, including sector-specific regulations, constitutional laws, criminal laws, and any other laws that entail provisions that

¹⁰ Unlike previous work, we can avoid biased estimates because we capture relevant amendments, sector specific regulations, and antitrust provisions in laws other than actual antitrust laws (such as cartel provisions in criminal laws). With the help of the foreign trained lawyers studying at Columbia Law School, we are also able to overcome almost all linguistic obstacles and ensure that our analysis is not limited to legislative materials and enforcement actions available in major languages only.

¹¹ Collaborative Research: The Law and Politics of Antitrust in Open Economies," NSF-Law & Social Sciences grants 1228453 & 1228483, awarded in September 2012.

¹² Given space constraints, we focus on explaining our coding of statutory instruments only, leaving aside the compilation of the enforcement data.

¹³ <http://www.qualtrics.com/>

¹⁴ We are also in the process of further gathering data on *judicial antitrust decisions* and key *institutional features* of enforcement institutions but that data is still highly incomplete and unavailable for the analysis at this stage.

govern competitive activity on the market. We have further coded these laws across 109 variables, ranging from the goals stated in the law, the scope of the law (including any enterprise or industry exemptions), the remedies the law provides as well as the substantive rules for mergers, anticompetitive agreements and unilateral conduct by dominant companies.

At this stage in the project, the research team has gathered some degree of data on 112 of the 119 countries. Fifty three of the countries have undergone the complete double coding process concluding with an independent discrepancy analysis. The team has completed single codings on a further 35 countries, and double codings without a discrepancy analysis on 24 countries. All results at this stage remain tentative, and the data may change materially for the 59 countries the team has only partially coded. 7 countries remain entirely uncoded. Based on this subset of 112 jurisdiction, the number of laws subject to coding for each jurisdiction varies between 1 and 45. Together, the database thus far consists of 693 of laws or regulations and hence the total of 75,537 number of variables.

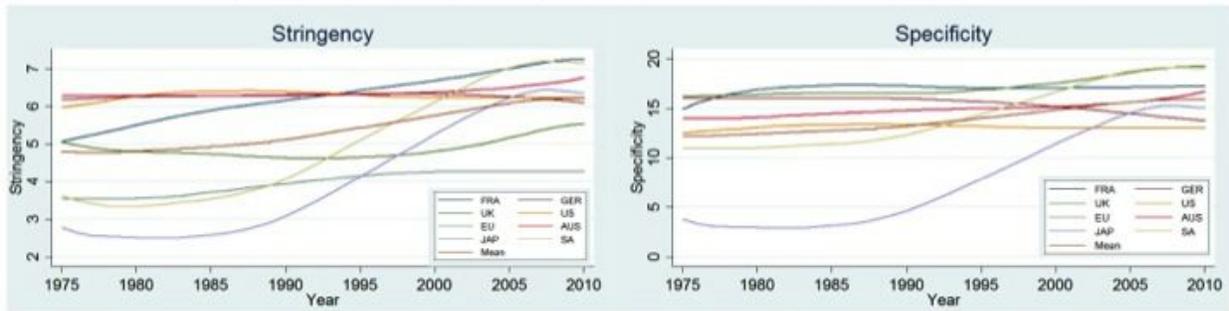
While these data can ultimately be used in a number of ways, we focus in this first analysis on two different policy indicators that we can draw from the cross-national antitrust laws database: *Antitrust Law Stringency Index* and *Antitrust Law Specificity Index*. The Stringency Index is developed to capture the “antitrust risk” that a company faces when it seeks to enter and penetrate the market in each jurisdiction. On a country-year basis, it measures the substantive prohibitions that a country’s (set of) antitrust laws contain on anti-competitive agreements, abusive practices by dominant companies or mergers. The broader the scope of conduct or practices that are prohibited, the higher the stringency score. Any defenses that the law provides (such as efficiency defense or public interest defense) reduce the stringency score as such provisions lower the likelihood that a firm will be found to be violating antitrust laws. We recognize that anticompetitive conduct cannot be deterred with substantive prohibitions alone. Our stringency index therefore also measures the penalties available for the antitrust agencies, the extraterritorial reach of the law, the availability of private enforcement and the extent to which the law’s reach is compromised through various enterprise-type or industry exemptions. The Specificity Index measures the scope or comprehensiveness of the law. As it captures the level of detail the law entails, it also serves as a proxy of the extent of delegation the legislator has extended to the antitrust agency (measuring both the powers given but also the constraints imposed on agency discretion). The more specific the law, the less discretion the antitrust agencies enjoy. Both indices are explained in detail in Appendix 3 and 4.

4.2 Data Trends

As a preliminary test on the robustness of our measures, we restrict our analysis to eight countries, including the United States, United Kingdom, France, Germany, Japan, Australia,

South Africa, and the European Union. The countries were selected to control for economic and political disparities, as well as to allow for variation in legal traditions. Limiting our focus to these countries still provides a robust sample with 237 observations. Figure 3 plots the stringency variable from 1975 to 2010. We see some countries like Australia and the United States started at high levels of stringent antitrust policies and remained there. Other countries like Japan and South Africa began the time span at the lower end of the stringency spectrum. Japan, for instance, doubled the stringency of its antitrust policies in the 25 year period measured, moving from a stringency score of roughly 3 to a score of over 6.

Figure 3: Stringency and Specificity Indexes by Country, 1975 to 2010



The bar chart in Figure 4 shows the aggregate trend for the measures for all countries over the study period. Both the stringency and specificity of antitrust laws have increased on average. However, the specificity of antitrust laws took a huge jump in the early 2000s, most likely reflecting convergence around EU antitrust policies.

Figure 4: Bar Chart of Specificity and Stringency, 1975 to 2010

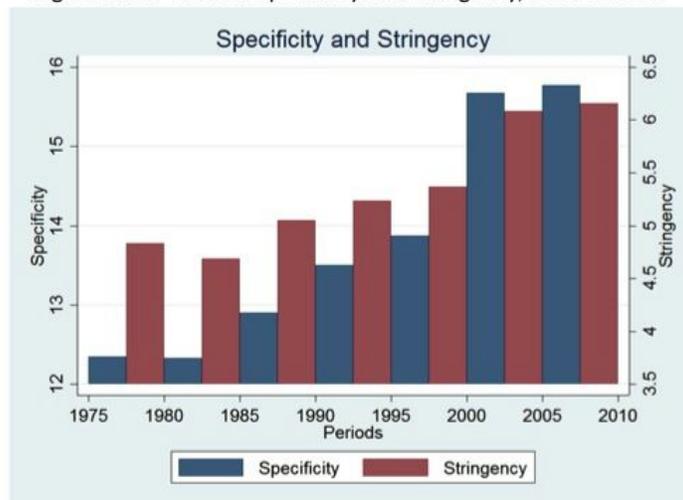
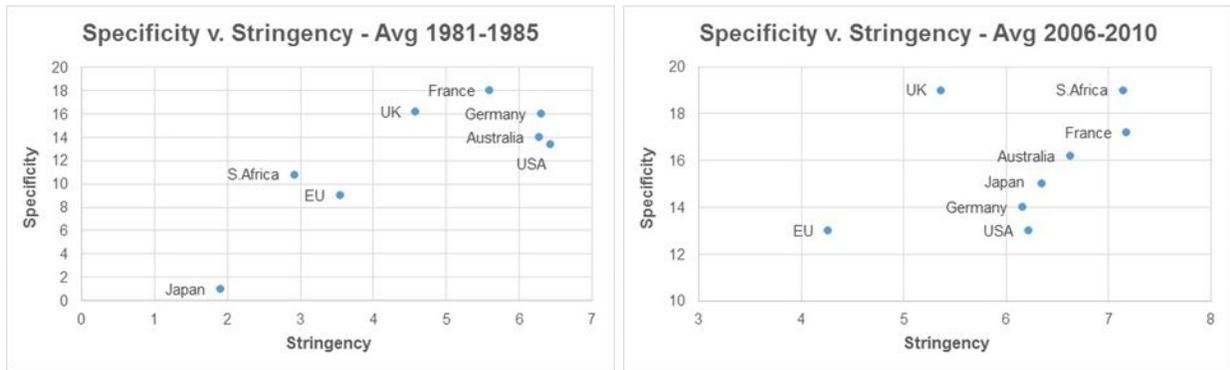


Figure 5 shows scatter plots of the average stringency and specificity of antitrust laws for each country near the beginning and end of our measurement period, demonstrating a consistently positive relationship between both measures. The plot indicates varying subgroups over time, and also shows that countries that added to their antitrust regimes through the period (Japan and South Africa) experienced substantial increases in *both* specificity and stringency. Countries that entered the period with well-developed regimes, on the other hand, demonstrated smaller, non-uniform movements.

Figure 5:

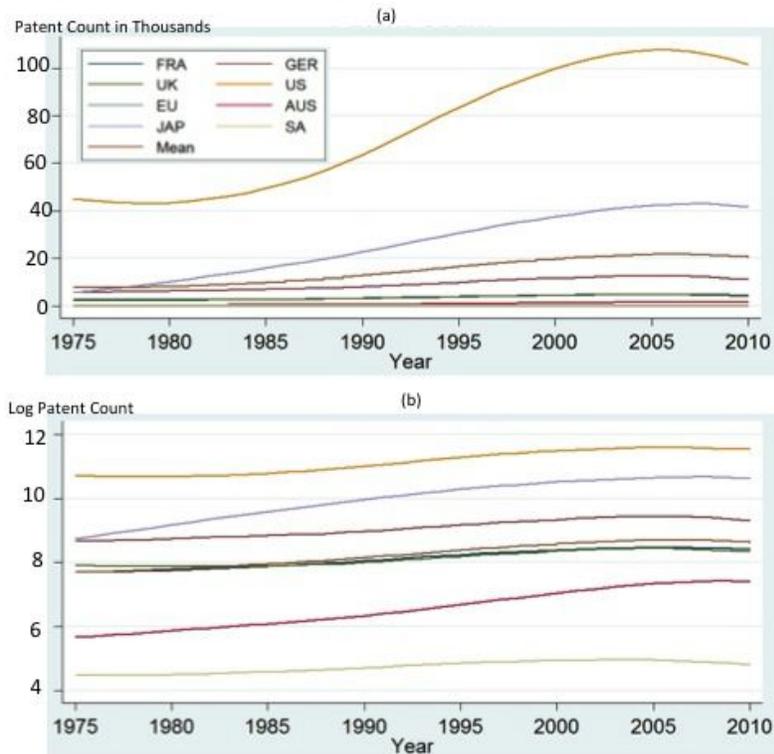


Our measure for innovation is patents granted by the USPTO from 1976 to 2010. Figure 6 (below) illustrates the distribution of patents over the time period for each of the sample countries. In line with the spread of antitrust policies, patents have increased significantly over the time period, leveling off around 2010. While all countries participated in the growth of patents, the US clearly dominated approved patent applications followed distantly by Japan. The log of patent counts in panel (b) of Figure 6 shows the same ordering of granted patent applications, demonstrating a rising trend and subsequent leveling off.

4.3 Measuring Innovation

The empirical analysis is motivated by the theoretical hypotheses derived above. The key outcome variable to be explained is innovation. Here, we use the U.S. Patent and Trademark Office (USPTO) data as a proxy for market innovation. The patent data contains all patent applications granted by the USPTO from 1975 to 2014. The data are aggregated by the number of patent applications for each year and country. During the time period, over 188 countries submitted applications to the USPTO, containing some 6,340,707 individual patent applications.

Figure 6: Patent Count by Year for all Countries, 1975 to 2010



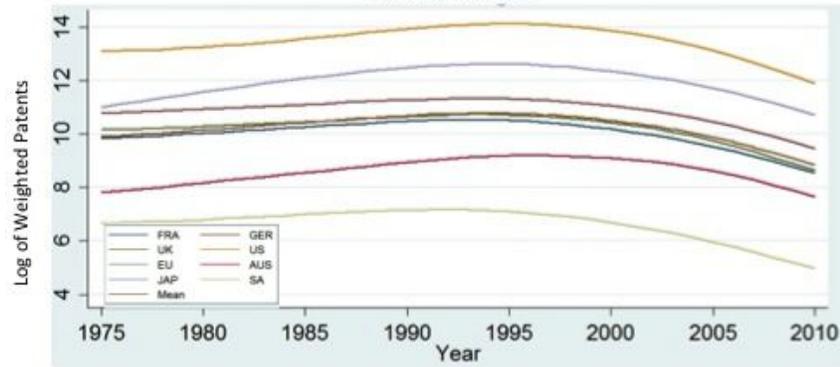
Patents have long been recognized as a rich source of information for studying innovation. Hall, Jaffe and Trajtenberg (2005) note the numerous advantages of patents as a proxy for innovation, including detailed information on inventors, terms of technology, and country of origin. Moreover, the U.S.P.T.O grants over 150,000 patents a year, making over time and cross country studies possible. Equally important, however, is the quality of those patents.¹⁵ The value of patent counts as a proxy for innovation is limited by considerable variance in the quality and impact of individual patents across industries and within sectors.

To account for these differences in the quality of patents and adjust for the noisiness of patents as a measure of innovation, we weigh each patent by the number of times it was cited by all other patents, excluding self-citations.¹⁶ The log of the weighted patent count shown in Figure 7 displays a similar picture as above: the US receives the most high quality patents, South Africa receives the least.

¹⁵ There is significant literature that uses counts of firms' successful patent application as an observable proxy for innovation. See Scherer (1965), Schmookler (1966), and Griliches (1984).

¹⁶ One issue that arises when using patent citation is the truncation of citations of more recent patents. Here we use the data provided by the USPTO patent database from 1975 to 2014. Our analysis ends at 2010, thereby mitigating some of the issues of truncation.

Figure 7: Log of Patents Weighted by Citation Count, 1975 to 2010



In addition, we add a number of political and economic controls, including GDP per capita, imports, exports, Polity 4 (which measures the strength of political institutions) and geographic latitude. Table 2 provides descriptive statistics.

Table 2:
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Per Capital GDP	252	20,327.6	13,212	1,403	51,801
Imports	237	292,313	350,502	6,501	2,166,020
Exports	237	258,211	249,254	7,975	1,300,190
Polity 4	252	9.32	1.52	4.0	10.0
Latitude	237	20.83	34.66	-32.2	51.51
Total Population	237	91,648.2	79,464.49	13,892	309,876
Patent Count	288	14,421.7	26,755	0.0	117,146
Cite Weighted Patent Count	288	164,420	380,784	0.0	2,287,672
Specificity	288	13.82	4.2	1	19.0
Stringency	28	5.36	1.44	1.9	7.57

V. Empirical Analysis

Our focus is to understand how the stringency and specificity of competition laws adopted and enforced by governments impact innovation. The stringency hypothesis states that given well-functioning democratic institutions, more stringent antitrust laws lead to more innovative markets. Without such institutions, we expect the impact of policy stringency on innovation to be indeterminate or even negative. The specificity hypothesis emphasizes the amount of discretionary authority that regulators are given to set and enforce antitrust law. The more specific the law, the more constrained the agent enforcing it. This reduces the risk of capture, with a positive effect on dynamic efficiency. Thus, specificity should also be positively related to market innovation.

To make robust causal inferences regarding the impact of specific policy features of antitrust laws on market innovation, we link the antitrust measures to market innovation as measured by patents. Specifically, we estimate:

$$Y_{it} = \alpha + \beta \Psi_{it-1} + \beta \phi_{it-1} + \varepsilon \quad \text{Eq. 1}$$

where Y_{it} is the log difference of the weighted patent count by country over time, Ψ_{it-1} is one of the antitrust policy indices, and ϕ_{it-1} is a series of economic controls that may also impact market innovation.¹⁷

As a first view into the data, we conduct robust least squares estimates, controlling for heteroskedasticity and time trends. Given that we are analyzing only eight OECD countries, including the European Union, we do not include country specific fixed effects here.

Table 2 shows the robust ordinary least squares results. Column 1 and 2 estimate the percent change of patent counts weighted by citations for each of the eight countries over the time period. The key independent variables of interest include stringency and specificity of antitrust laws by country over time. We also control for a number of economic variables like per capita GDP, imports, and exports, which can also impact market innovation. We include a one year lag structure to control for delays in the impact of antitrust policy on patent applications.

¹⁷ The estimation strategy follows closely from a related paper on competition policy and productivity growth in OECD countries from 1995 to 2005. See Buccirossi et al (2013) for details.

Table 3:
Log Difference of Patents Weighted by Citations, 1975 to 2010

Variable	Model 1 <i>Robust OLS</i>	Model 2 <i>Robust OLS</i>	Model 3 <i>IV</i>	Model 4 <i>IV</i>
Constant	0.20 (5.78)*	0.18 (4.06)*	0.29 (4.43)*	0.23 (1.78)
Stringency _{t-1}		-0.02 (-2.94)*		-0.03 (-1.20)
Specificity _{t-1}	-0.01 (-5.02)*		-0.02 (-3.74)*	
Per Capita GDP	-3.59 e-06 (-2.39)*	-3.68 e-06 (-2.45)*	-2.65 e-06 (-1.68)	-3.04 e-06 (-1.81)
Imports _{t-1}	-6.01 e-08 (-1.28)	-6.34 e-08 (-1.35)	-3.63 e-08 (-0.73)	-4.74 e-08 (-0.98)
Exports _{t-1}	-3.41 e-08 (-0.35)	-1.99 e-09 (-0.02)	-9.98 e-8 (-1.00)	-2.75 e-08 (-0.29)
Number of obs.	237	237	223	223
F(6, 216)	24.81*	18.46*		
R ²	0.20	0.1	0.17	0.18
Wald $\kappa^2(4)$			79.41*	69.08*

The results show a negative coefficient for stringency of antitrust laws, implying that more stringent laws lead to less innovation. The specificity of the laws is also negative and statistically significant. This suggests that the more specific or less discretionary are antitrust policies, the less innovation as measured by patents is observed.

These initial results may reflect inherent endogeneity in cross-country studies, a two-way causality relationship between the predictive variable (antitrust policy) and the dependent variable (patents), or omitted variable bias. The identification of this potential endogeneity between our key variables is most likely related to the omitted variable bias. For example, the strength of political institutions, the independency of the judiciary, lobbying by organized interests, and so on, could play a key role in the effectiveness of antitrust law.

To account for this potential identification issue, we follow Buccrossi et al (2013) and perform an Instrumental Variable estimation or two stage least squares. In the first stage equation, we estimate our instrument, antitrust policy measures (specificity and stringency) against a series of exogenous instruments. As we are estimating the impact of the policy features of antitrust law on innovation, it makes sense that we control for the effectiveness of political institutions. We use the Polity 4 index, which consists of six component measures that record key qualities of executive recruitment, constraints on executive authority and political competition. It also records changes in the institutionalized qualities of governing authority. To capture country specific effects, we also include total population and a country's latitude as instruments.

The second stage of the analysis uses the stringency and specificity instruments and estimate their effect on the percent change in patents, again controlling for possible economic effects. The results of the IV estimation shown in columns 3 and 4 of Table 2 reveal similar results. Stringency continues to have a negative impact on patents but is no longer significant. Specificity, on the other hand, remains stable: the index is negative and significant, even after controlling for economic conditions.

The findings illustrate the complexities of estimating the impact that competition policy has on market innovation. The stringency of antitrust laws is either negative or insignificant after controlling for various possible economic effects. This suggests that the strength of antitrust policy is not a key determinant of the percent change in the weighted patent count over time across these eight countries.

We emphasize that these findings are preliminary and tentative and rest on a partial analysis of still incomplete data. The results may change once we expand the analysis to the entire set of countries. We will also confirm the robustness of our composite indicators for stringency and specificity by repeating the analysis based on each sub-component of the respective index separately, adopting principal components analysis. Even with these adjustments, we recognize that our focus on antitrust *laws* alone capture only one aspect of antitrust policy.¹⁸ It is well accepted among legal scholars that the stringency of a law on the books is insufficient to ensure their enforcement. Hence, a more robust policy measure will also account for the enforcement resources and practices. Political institutions also matter. Well resourced and trained regulators with independent judiciaries are likely to be key determinants in measuring market outcomes. In later versions of this paper, we will take into account these possible effects as well. We will also examine whether the economic soundness of antitrust law, as opposed to its stringency, *per se*, leads to greater innovation. This alternative policy indicator will capture the quality of an antitrust regime as opposed to its quantitative stringency alone.

With all these caveats in mind, we have few preliminary thoughts on what may explain the initial findings with respect to this subset of countries. The negative relationship between innovation and the stringency of antitrust laws might reflect Aghion et al's (2005) argument that the relationship between innovation and competitiveness is not linear but rather an inverted U shape. In this scenario, when overall competition is low, we are likely to see more neck-and-neck competition and, hence, more innovation. But when competition is high, only laggard firms are

¹⁸ As an important expansion of the project, we have recently commenced the coding of case law by courts in jurisdictions where the judiciary has the power to influence the scope of the law. This will likely impact the scores of jurisdictions, including the United States, that rely less on statutory law and where court-made law plays an important role. An initial test coding of the U.S. revealed that 13 variables in our statutory coding instrument designed to capture regulation of abuse of dominance led to seven additional positive responses by the coder when analyzing case law as opposed to statutes alone.

likely to innovate. This suppresses the amount of overall innovation that takes place. The result is that the number of patents will decline and only large firms with ample resources will enter the patent market. If stringent antitrust policy is geared toward maximizing rivalry and leads to more competition, we might, therefore, expect exactly the unstable impact on innovation that our sample implies through the ambiguous effect stringency has on innovation. This would suggest that stringency score will fail to generate a positive relationship under most models. At the same time, our economic soundness index, which reflects a balance between tolerating and restraining market power, may be better able to identify the kind of variance in laws that positively correlates with innovation.

The negative and significant relationship between the specificity index and innovation challenges the well-entrenched political economy story according to which more agency discretion leads to increased capture, which presumably compromises the law's ability to foster innovation. The political economy story may well capture the situation in some subset of the countries we will analyze when the sample is extended to the full set of antitrust jurisdictions. But, for established, experienced and competent agencies (including those in our sample), we may see agency discretion has the opposite effect, especially if these agencies are independent from political control.¹⁹ Greater discretion may allow for more sound decision making as the expertise of the agency can guide the decisions. Less specific laws allow enforcement to incorporate the "rule of reason" principle, and flexibly respond to changing market conditions, while taking into account legitimate differences across industries and markets so that both static and dynamic efficiency is maximized.²⁰

VI. Conclusion: Policy implications

Antitrust laws represent some of the most contested policy tools that governments employ to shape the structure of the markets and influence the competitive environments in which domestic and foreign firms operate. Antitrust policy reflects a fundamental choice that determines the relative power balance between government and the market. It is therefore surprising that the large scale global proliferation of these contested laws rests on a very thin empirical foundation of their efficacy. At the same time, promotion of innovation is one of the most fundamental goals governments chase in their pursuit of economic growth and prosperity. Antitrust laws are often presumed to advance this goal, yet the causal mechanisms that would establish a link between antitrust policy and innovation is often under-theorized and empirically unverified. Our aim is to fill this gap in the literature with crisp theoretical and empirical insights.

¹⁹ This is a hypothesis we will test in future iterations of the paper.

²⁰ See Epstein and O'Halloran (1999) for the delegation of discretionary authority to regulators. See Groll, O'Halloran and McAllister (2015) for an application of the insights to the regulation of U.S. banking and financial service markets.

With this in mind, we have created a novel dataset capturing unprecedented detail on the scope, goals, and history of antitrust laws in 119 jurisdictions, matched by data on the enforcement resources and practices backing those laws. For this paper we employed a preliminary review of only eight OECD countries to examine our hypotheses regarding the impact of the stringency and specificity of their statutory antitrust regimes on innovation in their economies. Citation-weighted USPTO patent filing data provided a proxy for innovation. We anticipate that our early findings may change materially as we expand the analysis to include the remaining jurisdictions and account for other characteristics of the antitrust regimes, such as economic soundness, clarity of goals, actual enforcement practice, and scope of supplemental regulation through court-created common law.

Our initial analysis implies a significant negative relationship between antitrust law specificity and innovation, and an ambiguous to slightly negative relationship between antitrust law stringency and innovation. These results ran contrary to our hypotheses, based on widespread, though heavily debated, theoretical analysis, that stringent and specific antitrust law would minimize agency capture, foster productive regulation of markets, increase competition and promote innovation. If these results hold in our subsequent analysis, they may support two significant conclusions. First, application of stringent and comprehensive antitrust laws as currently drafted in various jurisdictions throughout the world may not have the ability to foster innovation. While such laws may provide other benefits, including potential facilitation of static efficiency, their expansion cannot be justified with the goal of contributing to innovation in the markets. Second, the inability of existing antitrust statutes to foster innovation does not imply that antitrust regimes could not be drafted to promote dynamic efficiency. But this will likely call for reevaluation of the theory underlying the laws currently in place and, ultimately, legislative reform. That said, any such conclusion would be premature given the preliminary nature of our findings to-date.

Appendix 1: Coding Methodology Overview

Project Overview

The purpose of this project is to capture the key statutory provisions defining the universe of antitrust legislation, including its scope, goals, and certain comparative elements of all antitrust laws, historical or current, for every country that has ever enacted such laws. The project covers more than 500 laws enacted by 119 countries over a time range spanning from 1791 to 2010. As of the time of this application, 47 countries have been reviewed by two annotators, 44 countries have been reviewed by just one annotator, and 28 countries have not yet been reviewed at all.

Unit of Analysis

The project's functional unit of analysis is defined as Active Legal Regime by country by year. The individual entries in the database represent the aggregated elements of an active statutory antitrust regime on the books in a country as of each year a change is made to that regime through the passage of a new statute or its legally binding equivalent. This includes separate entries for the passage of any amendments that make substantive changes to the antitrust elements being captured by this project. All entries incorporate the details of previously passed laws that remain active with the passage of the new law. While each entry, therefore, corresponds to a legislative enactment, the data captured aggregates the relevant aspects of all prior legislative enactments that remain legally binding. Note, when multiple changes are made to a statutory regime in a country in a given year, the changes are merged into a single entry.

Step-by-Step Methodology

The project has four stages and involves four levels of participants: Individual Legal Annotators, a Senior Annotator, a Project Leader, and Professor Anu Bradford. The team is composed of JD and LLM candidates at Columbia Law School and select undergraduate students enrolled at Columbia University.

The project's four stages include: Initial coding, Second Coding, Discrepancy Review, Managing Review. The Individual Legal Annotators complete the first three stages with the assistance of the Senior Annotator, the Project Leader and Professor Bradford. The Project Leader completes the Managing Review, before handing off the complete dataset for final review by Professor Bradford.

1) Initial Coding

Onboarding - Individual Legal Annotators are on-boarded via an in-person training session with the Project Leader, the Senior Annotator and Professor Bradford. This session includes an overview of the project and their role in its completion as well as a step-by-step run-through of daily responsibilities. They are provided with a detailed document describing those

responsibilities, including substantial sample statutory text from countries around the world and relevant analysis to use as a reference throughout their work. They are further provided with antitrust law primers to supplement their existing knowledge of antitrust law and its history. Finally, the Project Leader issues country assignments to each Annotator based on their language skills, knowledge of legal regimes and other relevant factors.

Survey - The basic role of the Individual Legal Annotators is to review the legal history of their assigned country, and gather the identified statutory elements defining its antitrust regimes throughout its history. This job has two steps. First, the Annotators are directed to review the legal history of their assigned country to ensure they have gathered any and all possibly relevant laws. The Annotators are presented a list of websites from which to start this search, including that of past projects documenting antitrust law, the US Department of Justice's website, the site of the relevant country's own antitrust authority or general legal database, and other related sources. When laws have been identified, but cannot be found on national databases or antitrust authority websites, the students are directed to pursue the following steps in an attempt to retrieve a copy of the law: 1) a search of the Columbia Law Library's international collection, 2) an inter-library loan request to a connected institution that shows the law on record in its collection, and 3) a direct appeal to the relevant antitrust authority through Professor Bradford.

Second, once the Annotators have gathered all the antitrust laws, they perform the actual collection of data on the relevant statutory provisions. Along with their training materials, the Annotators are provided a link to a survey hosted on Qualtrics.com. This survey includes 171 entry fields, including basic identifying information such as country, law name, year passed, and year enacted. The survey splits the project of analyzing a law into two steps. The first half of the survey addresses questions related to substantive statutory provisions. The second half of the survey addresses questions related to "legislative goals, legal traditions, exemptions" and other similar elements.

The substantive half of the survey contains seven sections on different elements of an antitrust law: Scope, Remedies, Private Enforcement, Merger Notification, Merger Assessment, Dominance, and Restrictive Trade Practices. When proceeding through each section of the survey, the Annotator is asked to provide yes-or-no responses to a series of questions regarding the existence of specific provisions related to that category. The yes-or-no questions regarding specific provisions are followed by write-in fields in which the Annotators are directed to copy the actual, relevant statutory text from the laws of the country they are documenting. The categories also include questions directed at identifying whether the statutory provisions are generally applicable, or only cover certain industries. These questions provide a list of pre-identified industries which the Annotators can check, as well as a write-in field for unanticipated, niche industries.

The goals half of the survey contains three sections: Legislative Goals, Legal Traditions or Resemblance, and Exemptions. The goals sections requests a yes-or-no response to whether legislative goals are specified in the law itself. This is followed by a list of pre-identified goals and policy justifications for antitrust laws which the Annotators can check, as well as a write-in field for unanticipated, alternative goals. The legal Traditions or Resemblance section provides a list of key pieces of language in the EU and U.S. antitrust regimes, and asks whether the legislation of the target country includes these phrases or nearly identical variants. The Annotators are asked to check each phrase that appears in the target country's legislation, and enter the precise location of the language in that legislation in an accompanying write-in field. The Exemptions section is constructed similarly to the partial coverage questions in the substantive survey, but asks about the law as a whole. This section provides a series of lists of pre-specified industries and broad categories such as "State-owned enterprises" and "government appointed and regulated monopolies" and asks Annotators to check which of these groups are provided complete or partial exemptions, or whether only these groups specifically are covered by the law. Write-in fields are provided after each question for unanticipated, niche industries.

Senior Annotator – A senior, more experienced antitrust student is identified as Senior Annotator. When Individual Legal Annotators come across a question regarding a specific provision and are uncertain of the answer, they are directed to submit the question, the relevant statutory text, and the reason for their uncertainty to the Senior Annotator for direction. Professor Bradford reviews the Senior Annotator's guidance and intervenes, if needed. If the Senior Annotator is unable to resolve their question, he further passes the query along to Professor Bradford.

2) *Second Coding*

Each country is assigned to two coders for independent review. Both Annotators follow identical procedures.

3) *Discrepancy Review*

Once a country's review is completed by two coders, the Project Leader retrieves the data from Qualtrics.com to prepare for a discrepancy review. The data is filtered through pre-formatted spreadsheet to provide easy, direct comparison of each Annotator's responses on a field-by-field basis for each law. The discrepancy analysis is then assigned to a third Annotator, who reviews the spreadsheet by examining all fields for which the Annotators provided differing responses, checking the actual text of the underlying law, and selecting a "best" answer. The third Annotators are directed to provide a comment for each field in which they resolve a discrepancy, explaining the reasoning behind their choice and pointing to the statutory language that supports

their decision. The output of the discrepancy review is a final, “consensus” response to every field for every law.

4) Managing Review

As a final step before submission to Professor Bradford, the Project Leader reviews each completed discrepancy analysis, looking for any incomplete fields in the consensus responses, or missing justifications for resolution decisions.

Appendix 2: List of Variables

National Law Variable Table

Statutory Aspect	Unit of Analysis	Data Collected	Sources
Basic Information	Active Statutory Provisions-Country -Year	Coder, Jurisdiction, Year Enacted, Year in Force, Law Name, Coded by Hytton?, Legal goals	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Goals or Policy	Active Statutory Provisions-Country -Year	Legal goals	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Legal Tradition / Resemblance	Active Statutory Provisions-Country -Year	Resemblance to EU Law?	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Exemptions	Active Statutory Provisions-Country -Year	Complete exemptions by category, Partial exemptions by category, Complete exemptions by industry	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Scope	Active Statutory Provisions-Country -Year	Extraterritoriality	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Remedies	Active Statutory Provisions-Country -Year	Fines, Prison, Divestiture in non-mergers, Divestiture in mergers	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Private Enforcement	Active Statutory Provisions-Country -Year	Private right of action, Private party remedies, Private initiation of agency investigation, Agency discretion over claims initiated by private parties, Private participation in agency proceedings	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Merger Notification	Active Statutory Provisions-Country -Year	Mandatory merger notification, Voluntary merger notification, Mandatory merger notification timing, Voluntary merger notification Timing	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Merger Assessment	Active Statutory Provisions-Country -Year	Merger review of market dominance, Merger review of restrictions on competition, Merger public interest defense, Merger public interest prohibition, Merger business failure defense, Merger efficiency defense	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Abuse of Dominance	Active Statutory Provisions-Country -Year	Abuse of dominance generic, Abuse of dominance through limited access, Abuse of dominance through tying, Abuse of dominance through loyalty discounts, Abuse of dominance through unfair pricing, Abuse of dominance through discriminatory pricing, Abuse of dominance through predatory pricing, Abuse of dominance through retail price maintenance, Abuse of dominance through competition exclusion, Abuse of dominance through competition elimination, Abuse of dominance other, Abuse of dominance efficiency defense, Abuse of dominance public interest defense	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Restrictive Trade Practices	Active Statutory Provisions-Country -Year	Restrictive price fixing, Restrictive market division, Restrictive output restraints, Restrictive bid-rigging or collusive tendering, Restrictive tying, Restrictive exclusive dealing, Restrictive retail price maintenance, Market entry restrictions, Restrictive competition elimination, Restrictive practices efficiency defense, Restrictive practices public interest defense	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Composite Index - Abuse of Dominance	Active Statutory Provisions-Country -Year	(Abuse of dominance generic) + (Abuse of dominance through limited access) + (Abuse of dominance through tying) + (Abuse of dominance through loyalty discounts) + (Abuse of dominance through unfair pricing) + (Abuse of dominance through discriminatory pricing) + (Abuse of dominance through predatory pricing) + (Abuse of dominance through retail price maintenance) + (Abuse of dominance through competition exclusion) + (Abuse of dominance through competition elimination) + (Abuse of dominance other) - (Abuse of dominance efficiency defense) - (Abuse of dominance public interest defense)	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases
Composite Index - General Antitrust Provisions	Active Statutory Provisions-Country -Year	(Divestiture in mergers) + (Merger review of market dominance) + (Merger review of restrictions on competition) + (Abuse of dominance generic) + (Restrictive price fixing) + (Restrictive market division) + (Restrictive output restraints) + (Restrictive bid-rigging or collusive tendering)	Hytton's AntitrustWorldWiki, Depart of Justice, OECD, ABA Regional Reports, Library of Congress, Global Competition Review, Zimmermann's Legal Research Guide, Westlaw, Lexisnexis, Pegasus, Brill Online, National antitrust agency resources, National legal databases

Appendix 3: Antitrust Law Stringency Index Construction

Variable	Effect on Stringency	Weighed Stringency Score
SCOPE OF THE LAW		
Enterprise and Industry Exemptions	Negative effect.	Maximum score = 1 (if no exemptions) Jurisdiction gets a maximum score of 1 if it has no exemptions. Every listed categorical (i.e., complete) enterprise/industry exemption reduces this score by 0.1. Every listed <u>partial</u> enterprise/industry exemption reduces the score by 0.05. The total reductions are capped at 1 so the minimum score the jurisdiction receives in this category is zero.
Narrow application (e.g., if the law only applies to certain sector(s) as opposed to the entire economy)	Negative effect.	Maximum score = 1 (if no narrowing) Jurisdiction gets a maximum score of 1 if it has no narrowing. Every listed narrow application reduces the score by 0.1. The total reductions are capped at 1 so the minimum score the jurisdiction receives in this category is zero.
AUTHORITY		
Extraterritorial application of law	Positive effect.	Maximum score = 1
Remedies	Positive effect.	Maximum score = 1 Fines (0.25) Imprisonment (0.25) Divestitures (0.125 from each component—merger and dominance—and hence 0.25 in total from divestitures) Private remedies (0.25)
Private Enforcement	Positive effect.	Maximum score = 1

SUBSTANCE		
Merger Control	Notification: Positive Effect Defenses: Negative Effect Assessment standard: No clear effect on stringency.	Maximum score = 1 Mandatory notification = 0.5 Voluntary notification = 0.25 Pre-merger notification = 0.5 Post-merger notification = 0.25 Defenses = -0.1 each (Efficiency, public interest, failing firm) Merger assessment standard = no clear effect on stringency
Abuse of Dominance	Prohibitions: Positive Effect Defenses: Negative Effect	Maximum score = 1 If the law generally prohibits the abuse of dominance (=“blank check”) = 1 OR If the law prohibits dominance but then narrows agency’s discretion by enumerating what constitutes abuse (tying, loyalty discounts etc.) = 0.14 each up to the total score of 1. “Other” categories count towards the total score and can also hence yield 0.14 each. Defenses = -0.1 each (Efficiency, public interest)
Restrictive Trade Practices (=anti-competitive agreements)	Prohibitions: Positive Effect Defenses: Negative Effect	Maximum score = 1 Cartel provisions: = 0.5 (0.125 each) Vertical agreements: = 0.5 (0.17 each or 0.5 in total) Defenses = -0.1 each (Efficiency, public interest)
		MAXIMUM SCORE OF 8

Appendix 4: Antitrust Law Specificity Index Construction

Variable	Weighed Specificity Score
SCOPE OF THE LAW	
Legal Goals	Maximum score = 1 Legal goals scored as 1 if any legal goals are specified for the antitrust/competition law.
Enterprise and Industry Exemptions	Maximum score = 2 Enterprise =1 Industry = 1
Narrow application	Maximum score = 1
AUTHORITY	
Extraterritorial application of law	Maximum score = 1
Remedies	Maximum score = 4 Fines = 1 Imprisonment = 1 Divestitures = 1 Private remedies = 1
Private Enforcement	Maximum score = 2 Private Action = 1 Private Enforcement =1
SUBSTANCE	
Merger Control	Maximum score = 4 Notification Requirement = 1 Timing =1 Assessment = 1 Defenses = 1
Abuse of Dominance	Maximum score = 3 General Dominance Prohibition = 1 Abusive Conducts = 1 Defenses = 1
Restrictive Trade Practices (=anti-competitive agreements)	Maximum score = 3 Cartel provisions = 1 Vertical agreements: 1 Defenses = 1
MAXIMUM SCORE OF 21	

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