

Comparing Merger Policies:  
The European Union versus the United States

by

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March 2007

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Paul Golaszewski, Wendy Hanson, Karl Kindler, Michael Madigan, Madeleine McChesney, Brian Murphy, Elisabeth Murphy, Joseph Remy, Adam Schwarz, and Matthew Tschetter played a role in assembling the US data and Johan Gars and Erik Sandgren assisted in assembling the EU data

## I. INTRODUCTION

Over the last twenty years, merger regulation has become a fact of life in virtually all of the world's major economies. The two most notable enforcement regimes operate in the European Union (EU) and the United States (US). Under both merger review processes, reporting requirements set thresholds that mandate that firms give the authorities prior notice of large transactions. The merger regulations, relying heavily on economic theory, set specific standards of review to facilitate the evaluation of potentially anticompetitive transactions.

Given the significance of the merger regimes in the EU and the US, an exploration of the similarities and differences between the two horizontal merger enforcement structures is a valuable exercise. Recent papers have evaluated both the EU and US enforcement policies and generally found that these policies are driven by the expected economic variables. However, in a few high-profile cases (*e.g.*, *Boeing/McDonnell Douglas* and *Oracle/PeopleSoft*<sup>1</sup>), the two jurisdictions appear to have come to different decisions. These occurrences have triggered a debate about the differences in enforcement standards. Against this background, our paper compares the enforcement regimes in the EU and the US by modeling their merger enforcement decisions. This analysis makes it possible to highlight both the unique and the generic characteristics of the two enforcement systems.

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<sup>1</sup> See EU Merger decisions M 877, *Boeing/McDonnell Douglas* (1997) and M 3216, *Oracle/PeopleSoft* (2004), and the US Merger decisions in *Boeing/McDonnell Douglas* (file number 971-0051) <http://www.ftc.gov/opa/1997/07/boeingsta.htm> and *Oracle/PeopleSoft* (file 04-117) [http://www.usdoj.gov/atr/public/press\\_releases/2004/202575.wpd](http://www.usdoj.gov/atr/public/press_releases/2004/202575.wpd). The former case was closed unconditionally in the US, while EU required substantial (although basically non-structural) remedies. The latter case was litigated by the US authority, but was cleared unconditionally by the EU after the completion of the US litigation (and thus the EU authorities had the benefit of the US court findings).

Our analysis suggests that economic theory plays an important role in both regimes. Dominance and collusion theories drive the two antitrust regimes. Empirically, the enforcement policies are significantly affected by similar structural and entry variables. Simulation analysis can easily predict enforcement decisions given the exogenous data, with mergers creating dominant firm likely to be challenged in both the EU and US. Moreover, a final analysis predicts an agreement rate in the range of 57-78 percent.

The analysis also identifies a number of differences between the EU and US enforcement regimes. We find that analytical variables such as countervailing buyer power and vertical considerations and findings of anticompetitive evidence appears to affect US enforcement more than EU enforcement while institutional issues seem to have a larger impact on the EU. When limiting the analysis to dominance/dominant firm transactions, a category of cases in which both the EU and US actively enforce antitrust policies, we find that EU enforcement probability is about 15 percentage points higher than what the comparable US model would predict, when focusing on the sample of EU merger cases. Looking instead at the US cases, we find the picture is more muddled; it depends on the specifics of each case and the particular hypothetical situation we investigate. For one simulation, the decomposition shows no difference in average enforcement. However, the second simulation shows that on average the US is 16 percentage points more aggressive than the EU. Graphical analysis suggests that the difference increases to up 20 percentage points for mergers in very concentrated markets. Disaggregated analysis at the case level shows mixed results, with the EU enforcement probability higher for some matters and the US higher for other matters. More detailed analysis suggests that the EU is more aggressive than the US for market shares below 75 percent, but less aggressive in the most

concentrated markets. A final set of simulations shows the US policy to be more aggressive for theoretically strong cases, while the EU regime is more active for marginal hypothetical cases.

Overall, it is not possible to characterize one regime as universally more aggressive than the other. The enforcement regimes for dominance cases are just different. In contrast, the simple overview of the enforcement results shows that the US actively enforced against mergers that tend to create or enhance oligopolies and challenged some matters with generic unilateral effects concerns (*i.e.*, where the unilateral theory is not related to market dominance), while the EU has rarely brought action against oligopolies and has not enforced against a generic unilateral effects matter. Given the 2004 EU merger reforms, it is unclear whether these differences will persist over time.

The study starts with a review of the literature in section II. Horizontal merger enforcement is a relatively easy bureaucratic decision to model, because enforcement itself is a discrete act, and many of the empirical analyses that underlie the enforcement decision are well identified in enforcement policy statements. These circumstances have generated a rich literature on which we can base our study. Section III presents a brief overview of the relevant economic theory. We introduce three models of anticompetitive effects used by competition authorities to analyze mergers: oligopolistic collusion, generic unilateral effects, and market dominance/dominant firm. The last of these, market dominance, is a special case of unilateral effects, in which the merged party is seen as dominating the market. The role of dynamic and static efficiency considerations is also discussed. Section IV describes the enforcement policies in both the EU and the US. We note a recent possibility for policy convergence, as the EU now acknowledges all three types of

anticompetitive-effects models are relevant. Historical comparison of enforcement regimes is limited to dominance cases, however, because the EU focused their enforcement on that theory.

Section V introduces the key explanatory variables used in the study, with the presentation including structural, entry, analytical, evidence, and institutional considerations. These variables set the foundation for the models presented in section VI. Core structural variables, such as market shares, Herfindahls, and the number of significant rivals, drive the enforcement decisions in both the EU and US, as does entry. On the other hand, the general analytical and effects evidence variables are statistically significant in the US, but not the EU model, while the institutional variables are all significant in the EU model. Section VII compares the two regimes, with the data limited to the dominance/dominant firm cases. The predictions of each model are compared in a search for clear differences in enforcement policy. Section VIII offers a few conclusions.

## **II. REVIEW OF THE LITERATURE**

As a decision with a clearly measurable outcome, merger enforcement almost begs for statistical analysis to identify the key variables that drive regulatory policy. Such an analysis could build on the assumption that bureaucracies behave in the public's best interest (*i.e.*, public interest models) and expect the merits-based variables to be decisive. Alternatively, the extent to which key rent-seeking variables affect the enforcement decisions could be assessed, hence testing the key proposition of public-choice theory.<sup>2</sup>

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<sup>2</sup> For a theoretical introduction on these issues, see Coate (2002). Simply put, bureaucrats may be controlled by stakeholders (public choice), social obligations (public interest), or politicians (political control). Politicians may advance alternative interpretations of the public interest (hence active enforcement need not benefit consumers) or be captured by the stakeholders.

The analysis could also test a political control hypothesis, with evidence suggesting bureaucracies respond to changes in the political environment supporting some type of political control result. Various quantitative studies of the merger review process address subsets of these questions.

Coate, Higgins, and McChesney (1990) used a probit model to analyze 70 merger cases handled by the US Federal Trade Commission (FTC), between June 1982 and the end of 1986. The explanatory variables focused on the Herfindahl, barriers to entry, and ease of collusion as interpreted by the FTC's legal and economics staff, along with a selection of political variables. The more these economic conditions were seen to be supportive of a competitive concern, the more likely the FTC was to challenge the merger. Hence, the result supported a public interest model of antitrust. Moreover, high profile transactions, mentioned in the Wall Street Journal, were more likely to be challenged, suggesting some type of public-choice issue in which high profile mergers were subject to more aggressive enforcement. The study also found indications that political pressure from the US Congress influenced the merger enforcement decisions at the margin. Follow-on studies further developed these initial conclusions, using new data as it became available (see, Coate and McChesney (1992), Coate (1995), and Coate (2002)).

Similar studies were undertaken by Khemani and Shapiro (1993) for mergers in Canada; by Weir (1992, 1993) for mergers in the United Kingdom (UK); and by Davies, Driffield, and Clarke (1999) for non-merger UK enforcement. The Canadian study found the acquiring firm's market share and, depending on the model, the Herfindahl to be important factors in the enforcement decision and also observed that the level of entry barriers and competition from imports were relevant. Weir (1993) noted that post-merger

market share did *not* appear to affect the authority's decision, but posited that the Monopolies and Merger Commission (MMC) was less likely to allow hostile mergers. These results can be interpreted as supportive of the public choice theory. Davies *et al.* (1999) used a probit model to analyze 73 non-merger single-firm competition cases handled by the MMC in the UK. They found that the likelihood of enforcement increased with the firm's market share, that enforcement was less strict after 1990, and that exclusive dealing was the type of conduct least likely to be tolerated. Thus, one can conclude that a merits variable (share) was important, suggesting support for a public-interest hypothesis. In contrast, the studies gave very limited support for public choice theory (as no reason was given for the special interest in exclusive dealing).

Bergman, Jakobsson, and Razo (2005) studied merger control in the EU using a sample of 96 mergers from the period 1990-2002. The authors found that market share and barriers to entry were positively related to merger prohibitions, while dummy variables indicating that the parties were incorporated in the USA or in one of the five largest member countries of EU (in this paper called *Big-5*) generally had no significant effect on enforcement.<sup>3</sup> Again, this study appeared to further confirm the public interest hypothesis for antitrust, with little evidence for the public-choice theory. Lindsay, Lecchi, and Williams (2003) reported similar findings, also on data for mergers notified to the EU.

In a recent study of US policy, Coate and Ulrick (2006) introduced proxy variables for evidence on customer complaints and incriminating documents (called *hot documents*), in addition to standard market structure and entry variables. The modeling approach also customized the structural variables to the relevant theory of concern. For the collusion cases, this meant that the Herfindahl index (along with its change) was used as the main

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<sup>3</sup> In one regression, the coefficient for US firms is negative, suggesting that US firms are favored.



structural determinant of the likelihood of enforcement actions. For unilateral effects, the focus switched to the number of significant rivals, as the count of rivals was considered the best proxy for the likelihood of unilateral action. The study confirmed both hypotheses. Customer complaints (and in one specification, hot documents) raised the probability of enforcement. Using a related but in some ways more comprehensive data set, Coate (2005b) added a proxy for structurally-based natural experiments suggestive of a loss in competition to the model. Even stronger results were found in this study, with the effects of the three evidence variables (customer concerns, hot documents, and natural experiments) found to have comparable impacts on the enforcement probability. These studies added support for the public interest theory but offered little for the public choice theory.<sup>4</sup>

Although many authors have explored single regime policies, there are few comparative studies of the merger regimes in the EU and the US, and those that exist are typically qualitative in nature or based on few cases. Lévêque (2005) used descriptive statistics to study 75 cases that were decided on both sides of the Atlantic, in order to investigate if one jurisdiction was more interventionist than the other. The author found that in 51 of the 75 cases, the FTC or the antitrust division of the US Department of Justice (DOJ) and the European Commission made the same decision. He also observed the FTC or DOJ unconditionally accepted four mergers that were allowed by the EU only after commitments (*i.e.*, settlements). In contrast, the European Commission unconditionally

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<sup>4</sup> Public choice advocates might make something out of the significant industry variables (*e.g.*, the oil industry faced more aggressive enforcement), but others would suggest that more aggressive policy is justified in selected industries.

approved 18 cases that were allowed by the FTC or DOJ only after commitments.<sup>5</sup> The results further showed that the FTC or DOJ unconditionally approved fewer cases than the European authority, both for mergers between two EU firms and between one EU firm and one US firm. These results appear to indicate that the US is more interventionist, but no strong conclusion should be drawn, because different geographical markets could face different competitive conditions.

Other authors have qualitatively compared the enforcement policies. For example, Venit and Kolasky (2000) argued that even though there are important differences in procedures, there has been a convergence of the substantive standards. While enforcement standards are not identical, they are “close,” though the authors note that the EU is somewhat more interventionist. Veljanovski (2003) addressed critical comments from US observers alleging enforcement standards are stricter in Europe; he argued that no such conclusions can be drawn from existing statistics. Morgan and McGuire (2004) focused on the controversial EU decision to block GE’s acquisition of Honeywell (a transaction allowed by the DOJ). They argued that the two authorities came to different conclusions, not so much because of differences in substantive standards, but because of what they considered to be inadequate analysis by the European Commission. This, in turn, was at least partially caused by a lack of checks-and-balances within the European system.<sup>6</sup>

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<sup>5</sup> In another case, the EU unconditionally approved the merger, while the matter went to litigation in the US. The final case settled in the US, but was litigated in the EU. Thus, agreements seemed to occur in 52 of the 75 cases.

<sup>6</sup> Recently, measures have been taken to introduce “checks-and-balances”; see <http://www.eurunion.org/news/speeches/2003/031024mm.htm>.

### III. PRIMER ON MERGER ANALYSIS

The goal of antitrust policy is to increase welfare. Although many academic economists support the application of an overall social welfare standard, antitrust enforcers usually focus on consumer welfare.<sup>7</sup> Economists generally agree that mergers are often pro-competitive (*i.e.*, enhance consumer welfare), because most transactions allow the economy to reorganize the methods of production and create more efficient firms. Consumers benefit from lower quality-adjusted prices, higher outputs, and more rapid introduction of new products. However, not all mergers are benign, as structural changes caused by a merger can lead to higher quality-adjusted prices, lower outputs, and a slower introduction of new products. To identify situations in which a merger is likely to adversely affect the competitive process, economists have developed a number of models to focus the analysis on key issues. These models differ slightly in their focus and assumptions. For example, competition between firms can be assumed to be in prices or in quantities. Different aspects of the strategic interaction between firms – such as collusion, entry decisions, and diffusion of innovation – can be included in the analysis or left out. Alternatively, economists can apply an institutional analysis to model the competitive process. Because there are different models available, the style of merger analysis could easily differ between the EU and US. On the other hand, given that the overall objective of both European and American merger regulation is consumer welfare, enforcement policies should exhibit significant similarities.

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<sup>7</sup> See Coate (2005a) for an overview of papers addressing the two standards.

At its core, merger policy involves the evaluation of two issues. First, will the merger in question significantly impede effective competition<sup>8</sup> (EU) or substantially lessen competition (US)? Second, will the same merger result in valid, substantiated, and merger-specific efficiencies? If the answer to both of these questions is positive, detailed analysis must be performed to balance the two off-setting effects.<sup>9</sup>

The traditional analytical technique starts by defining a relevant market in which to study the merger.<sup>10</sup> Then, once the product and geographic dimensions of the market are defined, the analyst picks one of three fundamental theories through which to study the market: collusion, generic unilateral effects, or dominance.<sup>11</sup> The collusion theory postulates a merger may make coordination among the remaining, smaller number of firms easier. The practical application of the theory focuses on three considerations. First, is the market sufficiently concentrated (*i.e.*, is the Herfindahl statistic sufficiently large) such that firms in the market can reach a consensus on an important aspect of competition, such as price, quantity produced, or innovation? Second, can the firms in the market track the market behavior of their rivals such that they can detect deviations from that consensus? Third, can the firms in the market decide on *and effectuate* a punishment scheme (*e.g.*, a price war) that serves to ensure the consensus is actually maintained over time? All three of these questions turn on the competitive conditions in the marketplace -- conditions that

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<sup>8</sup> As will be explained below, “significant impediment of effective competition” is the standard employed by the EU since 2004; during our period of observation the EU used a dominance standard to assess mergers.

<sup>9</sup> On occasion, the efficiency considerations can be integrated directly into the competitive effects analysis and generate a prediction for the post-merger price. Other situations would be more complex, requiring a balancing of a welfare loss from a direct price increase, with other welfare gains. As the Guidelines note, efficiencies almost never justify a merger to monopoly or near monopoly. (Merger Guidelines (1992) at Section 4.)

<sup>10</sup> The market model is an economic construct designed to focus the analysis of a specific behavior (*e.g.*, a merger) on the group of firms (competitors) most likely to affect the analysis. By focusing on the key rivals, the market model serves to simplify the very complex question of the merger’s competitive effect.

<sup>11</sup> In complex cases, multiple theories can be considered, but the facts of the case will normally allow the analyst to pick one as most relevant to the market at issue.

may be changed by a merger. If the new market structure creates or enhances a possibility for collusion, the transaction may adversely affect competition.

Generic unilateral effects theories study how a merger of relatively close competitors will alter the merged firm's incentives to compete in the market. This may involve a comparison of Nash-Bertrand equilibrium pre- and post-merger, in a differentiated products world. Quantitative or qualitative analysis can show that a merger is likely to substantially lessen competition when the independence of a key rival is lost through merger. An application of the theory must answer three questions. First, does the model under consideration actually replicate the competitive process? Second, are the merging parties actually sufficiently close competitors to matter? Third, are there few enough significant rivals in the market such that the parameters of the unilateral effects model are likely to remain stable in response to optimal re-positioning by rivals hoping to improve their competitive position following the merger? Given affirmative answers to these questions, a unilateral model could conclude that a merger is likely to raise price.

The third theory addresses the classic dominant firm situation. In its simplest form, the theory assumes that the merged firm can take the pricing policies of its remaining rivals as given and set a monopoly price using a residual demand curve.<sup>12</sup> Two variants of the theory are relevant: The merger will either (1) increase the power of an existing dominant firm through the acquisition of a large fringe rival or (2) create a dominant firm by the merger of two competitors. In either case, the key question is: Will the share of the merged firm become large enough to substantially increase market power? If the merger creates or strengthens a dominant firm, enforcement action merits consideration. Under all three

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<sup>12</sup> If capacity constraints limited the ability of all the firms in the market but the merger partners to expand, a Cournot-based model of quantity competition could lead to a competitive concern. In effect, the merged firm would be dominant (in the short run).

theories, it is necessary to investigate whether or not fringe firms and potential entrants would be able to discipline the dominant firm's pricing.

In addition to modeling the potential anticompetitive effects of mergers, economists also need to account for efficiencies. As noted in the classic Williamson (1968) analysis, static efficiencies shift cost curves down, inducing the firms in the market to produce more output at lower prices and benefit consumers. Before incorporating such efficiencies into a merger analysis, however, claims of cost savings must generally be corroborated with empirical evidence. Dynamic efficiencies (*e.g.*, increased ability to develop new products and enter new markets) are also important to consumer welfare. Thus, in any antitrust investigation, some consideration should always be given to the overall impact of the transaction. Structural changes may resolve various organizational problems or may be an efficient response to technical or organizational developments within the industry. If an economist finds both an anticompetitive effect and an efficiency saving from a merger, the analyst is usually left with a difficult balancing question between the two effects. In a few special cases, it may be possible to integrate the efficiencies into the core competitive analysis and predict a post-merger price.

Given the variety of structures under which to analyze a merger, different analysts working under different enforcement regimes could easily reach different conclusions. The enforcement regimes applied in the EU and US are explored in the next section.

#### **IV. AN OVERVIEW OF ENFORCEMENT POLICIES**

In this section, we provide background on the evolution of the US and EU enforcement regimes, to set the stage for the empirical comparison. Appendix A presents

an overview of the filing obligations under both regimes and lists some background data. The merger policies are now rather similar, but they evolved in dramatically different ways. Today, in both regimes, the market model is used to structure merger analyses. The relevant market must be defined in both the product and the geographic dimension. Products are considered to be sold in the same relevant product market when competition from one set of products constrains the market behavior of the sellers of the other products. The relevant geographic market is similarly defined as the smallest geographic area, within which the competitive realities are not significantly influenced by activities outside the area.<sup>13</sup> Naturally, a specific merger analysis may involve several relevant markets, as transactions generally combine large multi-product firms.

Under either the EU or US enforcement regime, the analysis of the merger's competitive effect sequentially moves through a checklist of considerations to address the expected impact of the merger. In the EU, the first step is to define the relevant market and the second step is to establish the level of market power held by the merging parties, pre- and post-merger. This second step also entails a choice between the theories of competitive concern (usually market dominance) as well as an assessment of entry barriers and other analytical factors that impact the assessment of market power. In the third step, the likely competitive effect of the merger is evaluated. Prior to the EU 2004 reform, the analysis in the third step was sometimes relatively shallow, either because an effect analysis was embedded in the second step, the "dominance test," or because it was presumed that a merger that led to the establishment of dominance or the strengthening of an already

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<sup>13</sup> (EU) Commission Notice on the definition of the relevant market for the purposes of Community competition law, Official Journal C 372, September 9, 1997. The US policy on market definition is memorialized in Section 1 of the Horizontal Merger Guidelines (1992).

dominant position also resulted in an anticompetitive effect.<sup>14</sup> Since the reform, more emphasis is placed on this step. In the US, the Merger Guidelines suggest that the analyst first define the relevant market, next identify a likely competitive concern (either unilateral effects or collusion), then move on to entry considerations, and finally evaluate the impact of the relevant efficiencies.

In the EU, merger enforcement developed in the early 1990's, although enforcement in individual member countries predated the unified policy. Current EU enforcement is based on the 2004 reforms that prohibit mergers that "significantly impede" effective competition. In comparison, US enforcement evolved over a much longer period of over 100 years. The current enforcement program in the US dates to the 1982 revision of the Merger Guidelines. Mergers that "substantially lessen" competition are likely to be challenged if they "create or enhance market power or facilitate its exercise."<sup>15</sup> As discussed below, a reasonable case can be made that the two competition policies are converging. We now discuss the historical evolution of the policies.

#### A. Background on European Merger Policy

Merger control, enforced by the European Commission, was introduced on September 21, 1990 (the 1989 Merger Regulation<sup>16</sup>). Although enforcement practices developed over time, the rules as such remained unchanged until May 1, 2004. The 2004 reforms required greater emphasis on the *effect* of the merger and less emphasis on

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<sup>14</sup> Fountoukakos and Ryan, 2005.

<sup>15</sup> Merger Guidelines (1982) at 1. See also, Merger Guidelines (1992) at 2 The Department of Justice and the Federal Trade Commission recently released a commentary on the Merger Guidelines to explain the application of the regulations in more detail. See, Joint Commentary on the Horizontal Merger Guidelines, March 2006. <http://www.ftc.gov/os/2006/03/CommentaryontheHorizontalMergerGuidelinesMarch2006.pdf>

<sup>16</sup> Council Regulation (EEC) No 4064/89 of 21 December 1989 on the control of concentrations between undertakings; see <http://ec.europa.eu/comm/competition/mergers/legislation/archive.htm>.



structural measures indicating the *level* of competitive pressure. This has widely been seen as a move towards the US merger standard.<sup>17</sup>

Article 2 (3) of the 1989 Merger Regulation stated that a concentration (merger) should be prohibited if it “creates or strengthens a dominant position as a result of which effective competition would be significantly impeded in the common market or in a substantial part of it.” The European Court of Justice had defined *dominance* as “a position of economic strength enjoyed by an undertaking that enables it to prevent effective competition being maintained on the relevant market by giving it the power to behave, to an appreciable extent, independent of its competitors, customers, and ultimately of consumers.”<sup>18</sup> In an often cited case, the court declared that market shares in excess of 50 percent are proof of dominance, absent “exceptional circumstances.”<sup>19</sup> More recent cases and the legal doctrine point to strong countervailing market power and particularly low entry barriers as examples of such exceptional circumstances.

Combining the view that the effects assessment is embedded in the dominance test with the mechanistic market-share standard suggested by the EC court in the cited case leads to the conclusion that mergers resulting in a market share higher than 50 percent would be challenged under the 1989 Merger Regulation. However, most textbooks on EC competition law suggest that the legal practice has been much more nuanced than that.<sup>20</sup>

It is reasonable to interpret the 1989 regulation to mean that the EU had decided to limit merger enforcement to the leading firm under the dominant firm branch of the

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<sup>17</sup> See, Fountoukakos and Ryan, 2005; 7 October 2004 speech by Commissioner Mario Monti ([http://ec.europa.eu/comm/competition/speeches/index\\_2004.html](http://ec.europa.eu/comm/competition/speeches/index_2004.html)); 11 February 2004 speech by OFT Chairman John Vickers (<http://www.of.gov.uk/News/Speeches+and+articles/2004/index.htm>) and 30 March 2001 speech by Commissioner Mario Monti “Prospects for Transatlantic Competition Policy” (<http://www.iie.com/publications/pb/pb.cfm?ResearchID=74>).

<sup>18</sup> *United Brands* (27/76) [1978] E.C.R. 207, para. 65. See also Korah, 1997, p. 78.

<sup>19</sup> Case C-62/86 *AKZO Chemie BV v Commission* [1991] ECR I-3359 para. 60

<sup>20</sup> Dethmers and Dodoo (2006), however, argue that EU’s analysis of dominance has been mechanistic.

unilateral effects theory. However, at least since 1992, the European Commission has addressed an oligopoly (collusion) concern by demonstrating that the merged entity, together with one or more other firm(s), held a *collectively* dominant position.<sup>21</sup> On the other hand, the EU studied few collective dominance cases. In the sample of 112 available Phase-2 cases (see below), we found only 16 cases for which the most relevant theory was collective dominance.<sup>22</sup> Thus, market dominance was the primary enforcement policy.

In the revised 2004 Merger Regulation,<sup>23</sup> Article 2 (3) now reads:

A concentration that would significantly impede effective competition, in the common market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position, shall be declared incompatible with the common market.

There are two important consequences of this new regulation. First, there is now a greater emphasis on demonstrating that competition is affected negatively by the transaction. Instead of focusing the review of dominance on the level of market power (*i.e.*, dominance), the EU is now committed to undertake a more detailed analysis of the likely effect of the merger, which can be interpreted as the change in market power stemming from the merger. In itself, this would be expected to reduce the range of enforcement initiatives. Second, a finding of a dominant position (actual or shared in the traditional European sense) is no longer an absolute requirement for a merger to be blocked. In particular, the revised regulations mention dominance only as an *example* of a concern that could allow enforcement against a merger with anticompetitive unilateral

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<sup>21</sup> See, *e.g.*, Commission decision IV/M.190 *Nestlé/Perrier* [1992] and the European Court of Justice's decision in the *Kali & Salz* case, formally known as C-68/94, C-30/95, *France v Commission* [1998].

<sup>22</sup> A theory of collective dominance has, however, been argued in more than 16 cases; we count only those cases where collective dominance was the most relevant theory for the most problematic of the concerned relevant markets.

<sup>23</sup> See, Council regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings; see <http://ec.europa.eu/comm/competition/mergers/legislation/regulation.htm>.

effects. Other concerns could also support enforcement, even though the merged entity would not become the largest firm in the relevant market. Prior to the reform, unilateral-effects mergers could only be blocked if the transaction involved the leading firm. As collective dominance would be considered to “significantly impede effective competition” under the same rules used for market dominance, it is possible that the revised regulations will also expand the reach of collusion analysis. This second aspect of the reform has the effect of increasing the range of enforcement initiatives. Of course, the magnitude of the effects remains an empirical question, and only time will tell how the new regulation will be applied.

Parallel with the revision of Article 2, the EU issued Horizontal Merger Guidelines to explain the analytical process.<sup>24</sup> In addition to discussing the competitive review, the new Guidelines introduced the concept of efficiencies into the regulatory mix. If a merger entails both anticompetitive effects and efficiencies, the European Commission has committed itself to a balancing of the two, from a consumer welfare point of view. However, in our sample, the Commission acknowledged the existence of efficiencies in only five cases and in no case were the synergies substantial enough to overturn a finding of competitive concern.

If the European Commission investigates a transaction, it must release a detailed justification of its decision to the public (all formal EU decisions are public, but Phase-1 decision documents<sup>25</sup> are usually brief). The European Commission has the power to prohibit mergers. Hence, after a finding that a merger will impede effective competition,

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<sup>24</sup> Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings (2004/C 31/03); see <http://ec.europa.eu/comm/competition/mergers/legislation/guidelines.htm>.

<sup>25</sup> See Appendix A for an explanation of the “phases” of the EU investigations.

the merging parties must either enter into a commitment with the EU to resolve the competitive problem or litigate to overturn the EU injunction.

## B. Background on United States Merger Policy

Evolution of horizontal merger enforcement in the US is somewhat different. Starting in 1890 with the Sherman Act, US policy evolved from an initial concern with monopoly to include a focus on the oligopoly problem (mergers to monopoly remained prohibited).<sup>26</sup> In 1968, with the first edition of the Merger Guidelines, the DOJ committed itself to closely review any transaction that could possibly adversely affect competition in a relevant market. The 1982 revision of the Guidelines revolutionized the analysis by introducing a market definition algorithm (the SSNIP test<sup>27</sup>) and formalizing the detailed analysis needed to conclude a merger was likely to substantially lessen competition. While the core of the Guidelines addressed the oligopoly problem (coordinated interaction or collusion), the concept of unilateral concerns was also mentioned under the guise of a dominant firm. As the enforcement agencies gained experience with the Guidelines, it became clear that many problematic mergers involved more complex unilateral effects.

The 1992 revision altered the enforcement process by detailing the concept of unilateral effects. This change had two consequences. First, it spelled out a specific model of analysis for dominant firm situations, moving away from a naïve appeal to structure and towards a complex economic analysis. Evidence would be expected to show the two

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<sup>26</sup> For an overview of the US enforcement program, see Bork (1978). The classic trust cases (Standard Oil and American Tobacco) are discussed at 33-40. Later developments in oligopoly merger policy associated with the 1950 revision of the Clayton Act are discussed at 198-224. Modern merger enforcement dates from the 1982 revision of the Merger Guidelines.

<sup>27</sup> The Small, but Significant and Non-transitory Increase in Price test (SSNIP) postulates a market exists when the price of a group of products produced by a set of firms could profitably be increased by a fixed amount (usually five percent), if the firms acted in concert, without the firms losing sufficient sales to firms outside the market to render the price increase unprofitable.

merging firms were head-to-head competitors and that rivals could not reposition to replace the lost competition. Facts suggestive of more complex market realities required further analysis to determine if the merger was likely to substantially reduce competition.

Second, it introduced a new form of analysis for differentiated products industries when the merger would not create a near monopoly.<sup>28</sup> Historically, these transactions had been handled with a general appeal to some dominant firm concept, but, by 1992, this form of analysis was becoming increasingly more difficult to apply at shares anywhere near the Guidelines' 35 percent cut-off. Another ten years of experience with the Guidelines has shown that these unilateral concerns were generally limited to markets in which only a few significant competitors drive the competitive process. Special case situations exist in which fact patterns allow for more aggressive enforcement. However, the evidence shows the core cases are generally spatial in nature, with the merger eliminating readily identifiable competition.<sup>29</sup> Efficiency considerations are integrated into the analysis, as efficiencies can either preclude the finding of competitive concern, or offset such a finding in a balancing analysis. Experience has shown efficiencies are rarely verifiable or substantial enough to overcome a serious competitive concern.

While the EU's decisions are legally binding to the parties (unless overturned in court), the enforcement authorities in the US must obtain some type of court order that

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<sup>28</sup> The move away from structure meant many mergers that would create firms with large shares (35 to 60 percent) could not be challenged under a dominant firm theory, because significant rivals remained to constrain the leading firm. These mergers could be challenged under the new (generic) unilateral effects theory. While 88 of the 96 transactions in the sample meet a simple approximation (see Appendix B) of the EU definition of dominance, detailed factual analysis suggests that only 53 of the transactions were effectively two-to-one mergers.

<sup>29</sup> A naïve reading of the 1992 Guidelines might suggest that the enforcer had "*carte blanche*" to attack virtually any merger where the products of the two firms can be related in any material way as long as the combined share exceeded 35 percent. Hence, one might expect a cascade of unilateral theories suggestive of problems in markets with four or five pre-merger competitors. In reality, this never occurred (possibly because enforcement remained constrained by the case law that required a plaintiff to prove a competitive concern once the respondent rebutted the structural presumption).

enjoins the transaction after an evidentiary trial to block a merger.<sup>30</sup> Notice of intent to seek such an order is usually sufficient to induce the merging parties to settle with the enforcement agency and resolve the concerns. Occasionally, negotiations do not lead to an agreement and the government must obtain a court order to enjoin the transaction. If the matter is settled, US regulations do not require the government to disclose all the details of its investigation, as only a few facts supportive of a concern must be put on the public record.<sup>31</sup>

### C. Comparing the Two Regimes

Overall, it appears that the European concern with market dominance closely tracks the traditional US concern with dominant firms, a concern that carried over into the formal unilateral effects analysis. While the 1992 US Merger Guidelines are relatively silent on dominance cases, the case-files are not, as staff regularly identifies two-to-one mergers. Moreover, FTC staff has applied more complex unilateral models to check for competitive concerns when a merger created a leading firm in a market, but that firm faced competition from smaller rivals. Hence, the policy the EU applied as dominance has always impacted US cases under either a classic dominant firm analysis or what might be called a strong form of the unilateral effects problem. Exactly which regime applied the more aggressive standards to such cases is an empirical question addressed in the following two sections.

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<sup>30</sup> There are some procedural differences between the DOJ and FTC. The DOJ files its merger challenges in federal court. The FTC seeks preliminary injunctions in federal courts, but litigates permanent injunctions in its own administrative court. As a practical matter, a preliminary injunction is almost always sufficient to block a transaction. The FTC can, but rarely does, move for a permanent injunction if denied the preliminary injunction in federal court.

<sup>31</sup> If the matter ends in a settlement, the US entity would disclose some information on the matter in a formal "Notice to Aid Public Comment" and if the matter results in a closing decision, the US entity could release a commentary on the merger evaluation. Neither document would approximate the detail contained in an EU presentation.

The US concern with oligopoly could be matched up with the EU concept of collective dominance, although the EU has reviewed few cases under this theory. From the proportion of collusion cases in our two samples, it is clear that the US historically applied a tighter oligopoly policy.<sup>32</sup> The 2004 EU enforcement revision is likely to lead to some convergence, although the magnitude of the effect is still unknown. As this paper creates a model of the US oligopoly enforcement regime, it will be relatively easy for analysts of EU enforcement to compare EU policy with the historical US regime.

Unilateral effects concerns that fell short of market dominance remained unaddressed in the EU until 2004. It follows that the US merger regime was more aggressive than the EU's, because the EU never advanced a general unilateral effects theory. Our empirical analysis suggests that these cases were also rare at the FTC, as only 8 matters failed to qualify under our operational approximation of the EU dominance standard.<sup>33</sup> EU regulators can now address this weak form of unilateral effects, but so far no clear cases have been found.

The EU and the US operate under slightly different oversight processes. For the EU, the firm must prevail in the extensive hearing process to overturn the bureaucratic decision, while in the US, the merger is presumed permissible until proven otherwise. However, firms presenting mergers in the US still face significant delay costs and therefore most merger challenges settle. Moreover, the transparency regimes differ, as the EU is obliged to release details on each enforcement decision, while the requirement to release

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<sup>32</sup> EU merger investigations focused on 16 collective dominance matters (roughly 14 percent of the sample). In contrast, the FTC data included 70 collusion cases, representing 42 percent of the sample. In light of the frequency of collusion analysis in oil and grocery matters, which are excluded from the sample due to data issues, the overall FTC focus on collusion is likely to be even larger. See, Coate and Ulrick (2006).

<sup>33</sup> Some might assert that the DOJ is more aggressive in enforcing these weak unilateral effects cases, as the DOJ historically makes more use of "merger simulation" than the FTC. Further research could address this issue.

case-specific data in the US is much less burdensome on the enforcer.

## V. OVERVIEW OF THE DATA AND THE MODEL

In light of the relatively similar merger review standards, our analysis focuses on modeling the final enforcement decision with facts taken from either the formal EU decisions or the official US internal memoranda by the investigations. The bulk of the data had been collected for previous projects, and thus it was only necessary to update each data set to create compatibility between the EU and US information. In the US, systematic data are only available for the Federal Trade Commission, so the study has no choice but to represent US policy with the FTC investigations. This section starts with a brief overview of the data collection process, addresses the enforcement models, and then introduces the variables used in the analysis.

### A. The Data Collection Process

The data collection started with the research files available from three recent papers: Bergman *et al.* (2005), Coate and Ulrick (2006), and Coate (2005b). As the existing EU and US datasets each contained some unique variables, these files were extended to include a similar set of variables for both the EU and the US. Additional observations were also collected to increase the sample sizes. The EU dataset was enlarged by including all the fully documented Phase-2 cases (rather than just half of them). This entailed collecting confidential information from cases that were withdrawn at the parties' request after they had been allowed to see the preliminary decision from the Commission (called the *Statement of Objection*). While many of these mergers raised multiple



competitive concerns, the analysis reviewed the most problematic market. The final EU sample contains 112 horizontal merger cases.

The construction of the FTC sample started with a 124 observation sample, in which the core second request investigation focused on a single horizontal market for the period 1993-2003. This sample was supplemented with data from two additional sources: the 22 observations in the original Coate and Ulrick (2006) sample that had two or three markets and an additional 20 observations involving similar cases, collected to extend the sample to cover the 1993-1995 period of time.<sup>34</sup> The data collection focused on the most substantial anticompetitive concern in all of the investigations. This process produced a sample of 166 observations.

The case files were reviewed using a standardized data-collection methodology. For the EU, the bulk of the formal decisions are publicly available on the web, while draft decisions for the withdrawn matters are retained by the national competition authorities -- in this case the Swedish competition authority. To collect the data, two students reviewed the published information and, when no published data were available, the confidential files, under the direction of the authors. At the FTC, the relevant information set was comprised of confidential memos written by the Commission's attorneys and economists. These memos were reviewed by pairs of research assistants and the results checked for consistency by one of the authors. The details on the data collection process are presented in Appendix B.

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<sup>34</sup> As noted in Appendix B, FTC second request investigations involving a large number of competitive concerns often lacked the detailed data needed for our empirical study.

## B. Modeling the Merger Enforcement Decision

To model the enforcement decisions of the European Union and the FTC, we use probit estimation, a choice that is appropriate for modeling binary decisions. Separate probit regressions are estimated for the EU and the US. The explanatory variables are identical when possible and comparable when differences in the structure of the evaluation process preclude the use of the same variables. Both collusion and unilateral effects are modeled for both the EU and the US. However, the analysis is mainly focused on dominance concerns due to the small number of collusion cases in the EU sample.

Like any econometric procedure, probit analysis allows for standard hypothesis testing and prediction. Hypotheses are specified in the next subsection and tested in section VI. Predictions of the models are compared in section VII.

The first model implements the economic theory underlying antitrust enforcement by selecting the fundamental structural variables that proxy the competitive concerns associated with a transaction in either the EU or US. Bergman *et al.* (2005) advanced combined post-merger market share as a key indicator of a merger's likely competitive effect under a dominance regime. In line with that paper, this study uses the combined post-merger market share. The increase in market share from the merger is also considered, along with an indicator variable for the unilateral effects theory.

In the US, the Herfindahl has been the key indicator of oligopoly since the introduction of the modern Guidelines' technique in 1982, while the number of significant rivals has evolved as the key unilateral effects index in the years following the introduction of the 1992 reforms (supplemented with an indicator variable for a unilateral effects case). Coate and Ulrick (2006) and Coate (2005b) confirmed that the Herfindahl index is relevant

as a structural proxy for collusion cases, and that the number of significant competitors is a statistically significant measure of competitive concerns in unilateral effects analyses.<sup>35</sup>

Entry impediments are generally seen as a very important condition for a competitive concern. This implies that mergers in industries characterized by substantial entry impediments should exhibit a higher probability of prohibition. Therefore, following Coate and Ulrich (2006), an entry index was added to the concentration variables. These variables, taken together, form the core model for both the EU and the US.

Numerous analytical variables may affect the ability of firms to achieve anticompetitive outcomes. Most of these factors are difficult to quantify and thus not readily modeled.<sup>36</sup> Two such considerations, investigated in the second model of this paper, are customer sophistication and vertical ramifications of the merger. First, buyer sophistication extends beyond its classic definition of buyer power (in which a large share of the market is held by few buyers) to consider the ability of customers to implement strategies designed to elicit competitive prices. If buyers are strong enough to keep prices at a competitive level, the merger is not harmful to consumers, other things being equal. Second, some horizontal mergers were found to generate vertical ramifications. The welfare effects of these vertical considerations are not always obvious. Vertical mergers could reduce a range of transactions costs (including the double-marginalization problem) and thus be efficient. On the other hand, it has been argued that vertical mergers could lead to a foreclosure problem.

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<sup>35</sup> Change variables are also relevant, but empirically less important. The change in the Herfindahl index is correlated with the level of the Herfindahl, while the change in the number of rivals is always one.

<sup>36</sup> Efficiency is one variable of interest that has been omitted from the analysis. The EU data set identifies very few matters with credible efficiency explanations, while previous work with FTC data suggested that the efficiency effect could be related to the lack of customer concerns (Coate (2005b)). Hence, it was impossible to create a direct test of the standard efficiency hypothesis.

Even the best economic analysis of a merger's effect is only a theoretical prediction that policy makers would attempt to test with exogenous evidence. Thus, a more complex policy model in which both theory and evidence variables affect the enforcement decision should be considered. Following Coate and Ulrick (2006) and Coate (2005b), our third model defines evidence variables to serve as proxies for other important information available to the enforcement agency. Evidence, such as validated customer concerns, hot documents, or historical natural experiments that reduced competition (events) serve to confirm the existence of a competitive problem.

Finally, it is possible that merger decisions depend on institutional variables, and therefore a fourth model is specified to consider these factors. Different jurisdictions may show favoritism to selected firms. For example, the EU may be more likely to approve transactions for firms from the large member states. Bergman *et al.* (2005) test for this effect and find no significant results, but the new data suggest that a second look would be warranted. The same question can be asked of the FTC. As previous studies showed no effect for nationality on US enforcement (*e.g.*, Coate (1995, 2005b)), the US variable is unlikely to matter.

The enforcement decision may also depend on the personalities controlling the respective regulatory regimes. For example, it has been suggested that Mario Monti, EU's competition commissioner for 1999-2004, was tougher than his predecessors, although Bergman *et al.* (2005) could not confirm the effect. The hypothesis can be retested with the more comprehensive data by using an indicator variable for Monti's time in office.<sup>37</sup> A similar test for the policies of the Pitofsky administration, 1995-2001, can be considered for

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<sup>37</sup> If the Monti affect led firms to abandon transactions, the impact of his regime would not have been detected by Bergman *et al.* (2005).

US enforcement, although there is strong existing evidence suggesting no effect exists (see the statistically insignificant results in Coate (2002) and Coate and Ulrick (2006)).

A third consideration would address the impact of the relevant geographic market being world-wide. In Bergman *et al.* (2005), the mirror image variable (local/regional markets) was used, although no significant result was obtained. No previous US study has focused on the type of geographic market. To some degree, this variable serves as a check on the confidence of the enforcer, because markets cannot be any broader than the world. If the enforcement decisions are made under uncertainty, regulators may behave in a less aggressive manner if they are concerned that their geographic markets are artificially narrow. If the analyst is using a world market, then he knows the competitive concern is not related to an artificially narrow market.<sup>38</sup>

### C. Variables Used in the Models

The dependent variable used in the analysis is a binary indicator, taking the value one if the outcome of an EU or FTC investigation was to enforce against the merger and the value zero if the outcome was to close the merger review. In the EU dataset, three different categories of cases were coded as enforcement actions: (1) mergers that actually were blocked, (2) transactions that were approved only after the parties offered substantial structural remedies, and (3) mergers that were withdrawn during the second phase. Mergers that were approved without the parties offering any remedies (or only minor remedies) were coded as closed.

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<sup>38</sup> It would of course be possible to interpret the size of the geographic market as an economic variable, reflecting the lack of a potential competition concern.

The FTC coding followed a similar procedure. Cases that (1) led to litigation in court, (2) resulted in mitigation of a structural effect, and (3) were abandoned in the face of a challenge were coded as enforced. Many investigations involved the formal termination of the merger review process, without any FTC action. Such cases were coded as closed in the data. The cases that ended in settlements that address ancillary concerns to the horizontal merger agreement were also coded as closed. Details on how the dependent variables are defined can be found in Appendix B.

As noted above, our analysis of the enforcement outcome focuses largely on the explanatory variables introduced in previous studies of merger enforcement. These variables are listed in Table 1. A simple definition of each variable is given, along with an initial prediction of whether the variable will increase or decrease the likelihood of enforcement. The empirical range of the variables is also listed, first for the EU data and then for the US data. Each set of variables is discussed below, with the commentary customized to the EU and US models.

We computed a number of market structure variables. These include the post-merger Herfindahl index (*Post-merger HHI*), its change (*Change-HHI*), the two pre-merger market shares (*Share-1* and *Share-2*), the number of significant rivals (*Rivals*),<sup>39</sup> and the combined share of the parties to the merger (*Post-merger MS*). Given EU concerns related to market dominance, share variables may offer the best proxy of the EU's approach to structural effects. Therefore, *Post-Merger MS* and *Share-2* (the market share of the smaller of the two merging firms) are used as structural indicators in the analysis. In contrast, FTC issues with coordinated interaction (collusion) appear best addressed with the Herfindahl index, while the number of significant competitors matters with respect to a unilateral

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<sup>39</sup> Appendix B presents the definition of the *Rivals* variable.

effects theory. High values of *Post-merger HHI* and low values for the *Rivals* variable should increase the probability of a merger challenge. Both the EU and US models contain a shift variable (*Unilateral Effects*) to allow for a higher enforcement probability in dominance and other unilateral cases.

Entry considerations are also highlighted in the data collection process. The dataset follows Coate and Ulrick (2006), creating an entry index based on information for the timeliness, likelihood, and sufficiency of entry. These three variables, discussed in the 1992 US Merger Guidelines, were studied, and the results gave rise to a simple index for entry that ranges from 0 to 3, depending on how many of the three entry impediments serve to deter entry. Higher values of *Entry Index* imply entry is less likely, and hence a merger is more likely to be challenged.

Standard merger analysis reviews a range of additional market-based considerations, though data limitations allowed us to consider just two more variables: buyer sophistication and vertical ramifications.<sup>40</sup> The indicator variable *Buyer Sophistication* focused on situations in which the staff analyses highlighted the potential for buyers to affect the competitive process in their market. As sophisticated buyers might have the ability to disrupt anti-competitive price increases, a negative sign is expected for the coefficient of *Buyer Sophistication*. The binary variable *Vertical Issues* identified horizontal mergers that exhibited vertical ramifications. Here, the expected sign on the variable is not clear. Vertical relationships sometimes create an opportunity for foreclosure. On the other hand, vertical efficiencies may yield benefits that are passed on to consumers.

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<sup>40</sup> Previous work by Bergman *et al.* (2005) used variables for network industries and world leader (one party to the merger recognized as the world leader), while Coate (2005b) tested for the effect of merger simulation analysis and efficiencies.

Market-based data can be combined with supplemental evidence that serves to confirm the theoretical prediction. The files were reviewed to collect this information and the results summarized in an evidence variable, *Evidence-Anticompetitive*. Following recent developments discussed in Coate and Ulrick (2006) and Coate (2005b), three forms of evidence -- validated customer concerns, hot documents, and natural experiments suggestive of a loss in competition from the merger -- were integrated into a single *Evidence-Anticompetitive* variable. This index is expected to increase the probability of enforcement; especially in the US (the EU presumption associated with a finding of dominance implies this evidence may not be central to EU decisions). For more information on how the variable was constructed, see Appendix B.

Finally, the study collected information for a group of institutional variables. The first variable, *National Player*, identified those matters in which the nationalities of the merging parties could possibly increase its ability to successfully influence the regulator. For the EU, this variable was constructed by reviewing the nationalities of the parties involved with both the acquiring and acquired firm. The index focused on entities with their headquarters in one of the five largest EU nations (France, Germany, Italy, Spain, and the UK). Since many transactions included more than two merging parties from different countries, an average large EU country parentage was computed for both the acquiring and the acquired side of the transaction. These indices were added together to create a variable that ranged from 0 to 2. For the US, the calculation was easier. Each transaction involved two entities and the number of these companies headquartered in the US was recorded (values of 0, 1, and 2 were observed). If a bias favoring local countries exists, the coefficient on this variable would have a negative sign. Another variable, *Enforcement*



*Regime*, focused on the identities of the Competition Commissioner (EU) or the Chairmen of the Federal Trade Commission (US). For the EU, the variable was set to a value of one for the time periods associated with the service of Commissioner Monti, while for the US, the variable identified the regime associated with the Pitofsky administration. If Monti enforced a tougher regulatory policy than other Competition Commissioners, a positive sign would be expected. If Pitofsky enforced more aggressively, the sign on the variable would also be positive.<sup>41</sup> The third coding focused on the geographic market involved in each case. The variable *World Market* flagged any matter in which the relevant geographic market approximated the world. If enforcers are more aggressive when the relevant geographic market is world-wide, holding all other factors constant, a positive sign would be expected for this variable.<sup>42</sup>

An overview of the data is presented in Tables 2 and 3. Sample means are given for both enforced and closed investigations, with Table 2 focusing on the full samples and Table 3 listing results for dominance/dominant firm cases. For the EU, moving from the full sample of 112 observations to the dominance sample of 96 observations meant deleting the 16 collective dominance cases. For the US, the full sample of 166 merger cases was reduced by 78 cases, to reach the sample of 88 dominance cases.<sup>43</sup> The raw sample probabilities suggest that the EU enforces 60 percent of its cases (although only 19 out of

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<sup>41</sup> Historical evidence would suggest the coefficient should not be statistically different from 0. See Coate and Ulrick (2006).

<sup>42</sup> It would also be interesting to investigate the effect of the 2004 revision of the EC Merger Regulation. However, the EU sample included only one case that was notified after June 1, 2004, making such an exercise difficult.

<sup>43</sup> The full US sample contains 96 unilateral effects cases. To reach a sample with pure dominance cases, the unilateral effects cases were then reviewed for market dominance, based on a definition linked to EU enforcement. To make the samples comparable, firms with a post-merger share of more than 10 percent greater than that of any rival were considered to be dominant firms in the US sample. Eight unilateral cases were dropped during this process.

141<sup>44</sup> Phase-2 cases were formal prohibitions), while the US enforces in 65 percent of its cases. If the sample is limited to dominance matters, the EU figure increases slightly to 66 percent, while the US enforcement rate leaps to 81 percent. However, it may be misleading to make anything out of these numbers, because the samples may not be comparable (due to the differences in specifics of the individual cases). As we show below, once enforcement is modeled, we can present more meaningful comparisons.

In general, the structural variables take on higher values when the matter leads to enforcement action than when it does not. Comparing the samples in Table 2 shows remarkable similarities. The structural variables exhibit almost identical means for the enforcement sample, but some differences are observed for the closed investigations. The largest difference occurs for *Rivals*, where the averages are 3 for the EU and 5.31 for the US. In Table 3, the means for US enforcement matters suggest slightly more concentrated markets, while the means for the closed US investigations are slightly lower than the comparable EU transactions. The means of the other control variables show little similarity. The EU sample includes a higher number of matters with vertical ramifications than the US sample. The US sample contains more analysis of buyer sophistication. These differences suggest that the regulatory processes may differ at the margin. The US also records more findings for the evidence variables, a result compatible with the differences in the styles of enforcement. These differences in the regulatory process will require caution in interpreting the differences in enforcement regimes.

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<sup>44</sup> We were able to use only 112 out of the 141 cases, as explained in Appendix B.

## VI. ESTIMATION OF THE MODELS FOR THE EU AND US

We focus on four fundamental modeling structures. Each structure has an EU and US version, for a total of eight models. As discussed below, the EU and US versions of each structure measure essentially the same thing, but the variables are tailored to the particular enforcement regime. We will refer to the four structures as Model 1 through Model 4. When it is necessary to distinguish between the US and EU versions, we prefix the EU version with “EU” and the US version with “US.” For example, the US version of Model 1 will be US1, and the European counterpart will be EU1. Estimation results for EU and US models are presented in Tables 4 and 5, respectively. Additional regressions designed to explore the robustness of the results are detailed in Appendix C.

Model 1, in the first column of Tables 4 and 5, is the baseline regression. It predicts the outcome with only the structural variables and entry. Model 2 introduces the two analytical variables: *Buyer Sophistication* and *Vertical Issues*. Model 3, in the third column of the table, adds *Evidence-Anticompetitive*. Finally, Model 4, in the fourth column of the tables, adds the three institutional variables to determine if these other factors might affect enforcement.

We model enforcement with a probit structure. Given the coefficients of the model, it is possible to compute a fitted value for each observation and generate a probability of enforcement ranging from 0 to 1. The structure is non-linear and therefore the coefficients do not define the marginal impact of their respective variables. Rather, the marginal impact of each variable is a function of the levels of all the variables and the values of all the coefficients. The impact of changes in the values of each variable on this probability is obtained by re-computing the probability with the new value of the variable of interest and

existing values for all the other variables. Further non-linearity is introduced into the model through the use of a logarithmic transformation applied to continuous (e.g., *Post-merger HHI*, *Rivals*, *Post-merger MS and Share-2*) and discrete (e.g., *Entry Index*, *Evidence-Anticompetitive*, and *National Player*) variables. When a discrete variable can take on the value zero, a one is added to the variable to enable the transformation to be defined at all possible values of the discrete variable. Binary variables (e.g., *Buyer Sophistication*) enter into the analysis as either zero or one.

#### A. Results of the EU Estimations

The estimated EU coefficients are presented in Table 4. The results from the baseline model (EU1) presented in the first column show that the market share of the smaller merging party has a significant positive effect on the probability of enforcement. Also, the coefficient on the *Unilateral Effects* indicator variable is positive and significant. This implies, holding all else equal, enforcement is more likely under a dominance theory than under a collusion theory. However, the post-merger market share, while exhibiting a positive coefficient, is not statistically significant. This result contrasts with the result presented in Bergman *et al.* (2005) where the combined post-merger market share had a significant effect on both the decision to initiate a Phase-2 investigation and the decision to enforce. A probable reason for this difference in results is that the cases closed in Phase-1 that normally have a low post-merger market share were included in the earlier analysis. Taken together, these results show that the post-merger market share is important for the decision to initiate a Phase-2 investigation but not important for the decision to enforce. This further suggests that when deciding to proceed to a Phase-2 investigation, the

European Commission has to rely on limited information on market characteristics and to a large extent relies on market-share figures. At the end of Phase-2, when more information is gathered on the market situation, the post-merger market shares no longer determine the decision.

Finally, the results show a significant positive effect for the entry variable. To give a sense of magnitude for this coefficient, note that an increase in *Entry Index* from 1 to 2 is able to balance a reduction in the share of the smaller firm from 26 to 10 percent.

The estimated model EU2 appears in the second column of Table 4. Neither of the variables introduced in this model (*Buyer Sophistication* or *Vertical Issues*) is statistically significant. This indicates that the effects of strong buyers and vertical concerns are inconclusive in the EU model. The share of the smaller merging firm and the entry variable remain significant in this specification.

Model EU3 adds *Evidence-Anticompetitive*. This variable has a positive but insignificant effect, suggesting that the hypothesis that the probability of enforcement increases with the number of factual anticompetitive findings cannot be accepted with the available EU data. The core structural considerations remain significant, with little change in their magnitudes.

The final column presents EU4, a model that adds the three institutional variables (*National Player*, *Enforcement Regime*, and *World Market*). All three variables are statistically significant in the estimation. The *National Player* variable exhibits a negative effect on enforcement. This means that if either of the merging firms is from a Big-5 EU nation, the matter has a lower probability of enforcement than otherwise. This effect increases if more than one of the merging firms comes from one of the five largest EU

countries. Roughly speaking, a Big-5 EU status (*i.e.*, *National Player* equaling one) will lower the probability of enforcement from 74 to 53 percent, in a hypothetical merger involving a 26 point increase in share (to a combined share of 70 percent), in an industry with two problematic entry conditions, with the other variables set to zero. The *Enforcement Regime* (*i.e.*, Commissioner Mario Monti) variable shows a significant positive effect on enforcement, implying that a case handled under Mario Monti has a higher probability of being enjoined. For example, under the same hypothetical shares and entry conditions, the enforcement probability of a Monti case is 92 percent, while the otherwise identical non-Monti case is 74 percent.<sup>45</sup> Finally, the coefficient for *World Market* is positive. This implies that when the relevant geographic market is world-wide, the probability of enforcement is higher than otherwise.

#### B. Results of the FTC Estimations

All US models start with the core structure explored in Coate and Ulrick (2006) and Coate (2005b), with the structural index allowed to vary according to the theory of concern. In Model US1 (column 1), the results show that *Post-merger HHI* matters for collusion cases and *Rivals* matters for unilateral cases. *Entry Index* is statistically significant and has a substantial effect on the enforcement probability. Moving from 1 to 2 entry considerations is sufficient to offset a drop in the *Post-merger HHI* from 3730 to 2500 or an increase in *Rivals* from to 3 to 4. Moreover, easy entry (*Entry Index* equals 0) generally

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<sup>45</sup> Note that the present study's estimates of the *Monti* and *National Player* variables differ from those found in Bergman *et al.* (2005). The inconsistency might be due to the 2005 study omitting those cases withdrawn after the notice of intent to "challenge," *i.e.*, after the parties having received the Statement of Objection from the European Commission. The earlier paper also includes some Phase-1 cases in the analysis. This may also be a reason for the different results.

precludes enforcement. These results are consistent with the fundamental hypothesis that structure matters in antitrust enforcement.

Model US2 adds *Buyer Sophistication* and *Vertical Issues*. Both variables are statistically significant and have substantial negative effects on the probability of enforcement. For example, even if the *Post-merger HHI* is 5000, a finding of sophistication reduces the chance of enforcement from 79 percent to 33 percent, when only one entry condition is identified. Unilateral cases are affected in a comparable manner. The effect of *Buyer Sophistication* was expected and is especially relevant for collusion cases, as strategic buyers may undermine a collusive agreement. When the concern is unilateral, the sophisticated buyer may induce a product repositioning or represent a threat to facilitate entry and thereby enhance competition in the market. The reason for the negative *Vertical Issues* effect is less obvious. A possible interpretation is that mergers with vertical ramifications often improve the functioning of other markets by reducing transactions costs. If these efficiencies are inextricably linked to the merger, the Merger Guidelines require the savings to be considered. Possibly substantial vertical efficiencies can outweigh competitive concerns in small markets.

Model US3 (column 3) adds the evidence variable (*Evidence-Anticompetitive*) to the model and finds a statistically significant positive effect. Roughly speaking, finding evidence of an anti-competitive concern (a customer complaint, hot document, or anticompetitive events) has an effect on enforcement comparable to increasing the *Post-merger HHI* from 2400 to 4800 or moving from a market with four rivals to a market with two rivals, when holding the entry index at one impediment and the analytical variables at zero. The statistical conclusion that evidence affects enforcement policy is not surprising,

as the FTC must be prepared to litigate in court. Regulatory presumptions or economic theories are poor substitutes for hard facts.<sup>46</sup>

Model US4 (in the final column) includes the three institutional variables (*National Player*, *Enforcement Regime*, and *World Market*). Only the *Enforcement Regime* variable is significantly different from zero, with a coefficient that materially lowers the probability of a complaint. This result turns out to be fragile (see Table C-2 in Appendix C) and thus the conclusion that Chairman Pitofsky was a less aggressive enforcer than the Chairmen appointed by Republican Presidents should be given little weight. Moreover, the previous study (Coate and Ulrick (2006)) found no comparable effect, again suggesting the result should be discounted.

### C. Model Fit

Table 6 offers initial insight into the explanatory power of the variables included in the EU and US models. For the first step in examining this issue, we look at the success of each model in predicting enforcement. For the purpose of this comparison, a *correct prediction* is defined as any enforced matter with a predicted probability of 50 percent or more or any closed investigation with a predicted probability of less than 50 percent.<sup>47</sup> To ensure compatibility in the data, the US predictions were generated only for the 88 matters that match the EU concept of market dominance.

The first row in each portion of the table shows the success rates of Models 3 and 4 at predicting the actual outcome. With regard to Model 3 (estimated without the

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<sup>46</sup> More information about the impact of the variables on the probability of enforcement is shown in Table 8.

<sup>47</sup> Of course, when the model predicts that the likelihood of enforcement is, *e.g.*, 51%, it does not imply that the matter will be enforced -- in fact, there is a full 49% chance that the matter will close -- but this definition is useful in this comparison since the 51% prediction implies that a matter is more likely to be enforced than to close.



institutional variables), the US model predicts 92.0 percent of the outcomes correctly, while the EU success rate is 74.0 percent. Adding the institutional variables in EU4 improves the EU success rate to 81.3. The US counterpart, US4, predicts basically as well as US3. The average value for the enforcement predictions is presented in the second row of each segment in the table. Overall, these numbers approximate the sample means for the binary enforcement decision, with the EU mean of 65.4 percent (sample mean 65.6 percent) and the US mean of 79.8 percent (sample mean 80.7 percent). Moving the focus to the two possible outcomes of the investigation (*i.e.*, enforcement or closure), shows that the US3 model predicts an average enforcement probability of 91.8 percent for the matters that were challenged and a much lower probability (29.6 percent) for the closed investigations (results for US4 are comparable). The EU3 model generates an average of 73.5 percent for enforcements and 50.1 percent for closed investigations (results for the EU4 model are slightly higher).

Next, we apply a more formal measure of model fit: We look at the mean squared errors (MSE's) of the EU and US models. The MSE is a common econometric construct that (heuristically) measures the average difference between a model's prediction and the true outcome.<sup>48</sup> For example, if one model routinely predicts a 99 percent probability of enforcement for enforced matters and a 1 percent chance of enforcement for closed matters, it is clearly a better model and will have a much lower MSE than a model that usually predicts closer to 51 percent for enforced matters and 49 percent for closed matters. (The prediction in the former conveys much more certainty, while the prediction in the latter conveys little definiteness in the outcome.) The MSE's for the models appear in Table 6.

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<sup>48</sup> So, for example, if the true outcome is 1 (*i.e.*, enforce), and the predicted outcome is 99%, the error in the prediction is  $1 - .99 = .01$ . If the true outcome is 0 (*i.e.*, close) and the predicted outcome is 49.9%, the error is  $1 - .499 = .501$ . This error is squared and averaged to compute the MSE measure of the model's fit.

For the EU full sample, the MSE is 0.173 for EU3 and 0.149 for EU4. When instead looking at the enforced and closed cases separately the MSE is smaller for the enforced cases (0.105 for EU3 and 0.096 for EU4) and larger for the closed cases (0.301 for EU3 and 0.250 for EU4). This indicates that the models are better in explaining the decision to enforce than the decision to close a case. The same general pattern is observed for the US cases, although the statistics suggest the US model is more accurate than the EU model. For US3, the MSE is 0.0645, while for US4; the MSE is lower at 0.0563. Enforcement matters show an even lower MSE, while the closed matters exhibit a higher statistic.

The results of the exercises in this subsection suggest that our model of the US regulatory regime predicts outcomes more accurately than our model of the EU regime. Possibly, the US focus on evidence and customer sophistication data enables that model to perform better. Another possible explanation is that lower quality of the EU data causes the somewhat unsatisfactory performance of the EU model. As discussed in Appendix B, the text available in the EU decisions was often less explicit than that available in the confidential US files, creating difficulties in coding some of the variables, such as entry barriers.

## **VII. COMPARISON OF ENFORCEMENT REGIMES**

Although the results of the statistical models, presented in the previous section, highlight a number of differences in enforcement policy, the average enforcement rates for comparable cases may be similar. As before, to compare enforcement, we focus the analysis on dominance-related cases reviewed in either the EU or US. For the EU, this is the entire unilateral effects sample of 96 cases, while for the US, this involves 88 of the 96

unilateral effects cases in which the merged firm appears to dominate the market.

Interestingly, simply looking at the unconditional enforcement rates for dominance cases suggests that the US policy is more aggressive, with an average enforcement rate of 80.7 percent, compared to the EU rate of 65.6 percent. However, comparing the unconditional enforcement rates is unproductive, as the EU and the US have different case mixes; even if the enforcement regimes were identical, there could be a difference in the overall enforcement probabilities. Therefore, in this section, we concentrate on analyzing the extent to which the difference in the unconditional rates is actually due to enforcement regimes as opposed to case mix.

#### A. A First Analysis of Enforcement Differences

As a first step, we consider the hypothetical situations describing how each enforcement agency would have decided if it were confronted with the other agency's cases. The specific methodology for this experiment is as follows: We obtain a set of hypothetical predicted values by feeding each EU merger through the estimated US model. Each observation's predicted value gives the likelihood that the FTC would have challenged the particular merger, had that transaction been filed in the US. The average of the predicted values from all cases gives the hypothetical US overall enforcement rate on the EU case mix. The analogous exercise is done using the EU parameters and the US case mix to obtain the hypothetical enforcement rate of the EU on the US cases.

The top part of Table 7 lists the results of this exercise and shows the hypothetical EU rate for the US cases and the hypothetical US rate for the EU cases. Three columns are given: one for Model 3 and two for Model 4. Focus first on Model EU3. We find the EU

coefficients applied to the US data give a hypothetical EU enforcement rate of 81.2 percent. This value is slightly above the actual US rate of 80.7 percent. From Model US3, we find the hypothetical US enforcement rate for the EU data is 47.4 percent. This rate is substantially below the actual EU rate of 65.5.

Before discussing the results from Model 4, we must briefly distinguish between two interpretations of the hypothetical predictions that were presented in the above exercise. First, we can consider what would happen if the EU faced the *exact same* cases that the US faced, and vice versa. Second, we can predict how the EU and US would have treated the same *type* of cases. The hypothetical predictions on Model 3 are consistent with either interpretation. However, we must treat the *National Player* variable (introduced in Model 4) differently under the two interpretations. For example, under the first interpretation (*i.e.*, where the EU and US examine the exact same cases), if the US and EU both examined a particular merger between two (Big-5) European firms, the EU would exhibit lower enforcement, while the US would not. Thus, in this situation, we let the *National Player* variable reflect the actual home of the merging companies, when making the hypothetical predictions. In the second hypothetical, however, the *National Player* variable must reflect whether a merger is between companies possibly considered advantaged by the regulator whose enforcement rate we are predicting. For example, if a merger is between national players in the EU, we assume that the case involves national players when predicting how the US regulators would have handled it (*i.e.*, the same type of case -- a merger between Big-5 companies). Similarly, if a case in the EU is between two American firms, the EU would see this as a merger between non-Big-5 players. Thus,

when computing how the US would have handled this type of case, we assume that the US regulators see the merger as one between non-favored players as well.

First, focus on how the EU would decide if it faced the same type of cases as the US. Table 7 shows (in column labeled Model 4A) that this hypothetical enforcement rate is 64.7 percent. This figure is lower than the EU rate of 80.5 percent for the exact same cases (in the column labeled Model 4) and virtually identical to the actual EU enforcement rate. Thus, one must conclude that the choice of the hypothetical situation impacts the predictions of how the EU would have handled the US cases. Moving on to the US model, we show no big changes in the hypothetical enforcement rate, as the expected level of enforcement falls slightly from 50.9 to 50.1 percent. In effect, nothing changes for the US regime and the EU mergers. The dramatic difference for the predictions of the two regimes can be traced to the substantial differences in the number of National Players each regime faces and the way each authority treats such companies. Many of the mergers in the US are between National Players, so in the hypothetical situation where the EU faces the same type of cases, the EU will face many National Players as well, and have a large effect on the predictions. In contrast, the EU case mix involves fewer national players, and therefore, the impact of the variable will be smaller on the predicted enforcement in the hypothetical situation where the US faces the EU cases.

In sum, the results show that the US regime would be less strict than the EU both when facing the actual EU cases, as well as when facing a set of hypothetical cases of the same type as the EU. The EU enforcement, on the other hand, would be virtually identical to the US when facing the same exact cases, but significantly less strict when facing a set of cases of the same type as those reviewed by the US authorities.

## B. Decomposing the Difference in Enforcement Rates

Given the differences in the hypothetical enforcement rates, it is interesting to measure the portion due to regime as opposed to case mix. To this end, we use a generalization of the Oaxaca (1973) decomposition. The Oaxaca decomposition is common in analyzing wage gaps in labor economics (for a summary, see Berndt, 1991) and is usually applied to a linear model. We extend the decomposition in a fashion similar to that in Ulrick (2005) to handle the nonlinear probit model. This generalization involves basic distribution theory and is discussed in Appendix D of this paper. Here, we introduce the decomposition in the context of a linear model, because the relevant mathematics is uncomplicated. The intuition of the nonlinear decomposition is essentially the same.

Suppose that the linear models were

$$y_e = X_e \beta_e + \varepsilon_e ;$$

$$y_u = X_u \beta_u + \varepsilon_u ,$$

where  $y_{\bullet}$  represents the enforcement outcome,  $X_{\bullet}$  represents the factors affecting enforcement,  $\beta_{\bullet}$  represents the parameters,  $\varepsilon_{\bullet}$  represents the error, and the  $u$  and  $e$  subscripts represent the US and EU, respectively. Note that the parameters measure the influence of explanatory variables on the enforcement outcome (*i.e.*, the parameters define the regimes).

Using upper bars to represent averages, we can write the difference in the enforcement rates as

$$(1) \quad \bar{y}_e - \bar{y}_u = \bar{X}_e \beta_e - \bar{X}_u \beta_u.^{49}$$

The goal is to decompose  $\bar{y}_e - \bar{y}_u$  into the difference due to the regime ( $\beta_e$  and  $\beta_u$ ) and the case mix ( $\bar{X}_e$  and  $\bar{X}_u$ ). Adding +/-  $\bar{X}_u \beta_e$  to the RHS of (1) and simplifying gives the decomposition:

$$(2) \quad \bar{y}_e - \bar{y}_u = \bar{X}_u (\beta_e - \beta_u) + (\bar{X}_e - \bar{X}_u) \beta_e.$$

Used here, the (simplified) intuition is this: The difference between the coefficients in the US and the EU can be considered the portion of the enforcement gap due to the regimes, because the likelihood that each authority will enforce against a particular merger is predicted by the coefficients. The remaining portion is due to the case mix. In calculating the difference of multiple coefficients, one must use some sort of an index to weight the coefficients. Mathematically, in the Oaxaca decomposition (2), this difference is weighted by the US covariates (data). Note that there is an indexing problem in (2). That is, we could have added +/-  $\bar{X}_e \beta_u$  to (1) to obtain the decomposition

$$(3) \quad \bar{y}_e - \bar{y}_u = \bar{X}_e (\beta_e - \beta_u) + (\bar{X}_e - \bar{X}_u) \beta_u.$$

Here, the difference in the coefficients is weighted by the EU data. In applications, the decompositions using both sets of weights are reported.

Returning to Table 7, and weighting the difference in the coefficients in US3 and EU3 by the US data, the results show that virtually none of the difference (-0.5 percentage points) is linked to differences in enforcement regimes, while virtually all the 15.1 percentage-point gap is due to the distribution of cases (the computed figure is 15.6 percent which allows for the -0.5 percentage points associated with the regime difference). As the

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<sup>49</sup> Note, we have  $\bar{\varepsilon}_e = \bar{\varepsilon}_u = 0$ , so these terms vanish.

difference due to the coefficients is only -0.5 percentage points (according to this US case indexing), one can conclude that if the US and EU had similar cases, the EU would enforce only marginally more often. The first scenario associated with Model 4 gives a nearly identical result of 0.2 percentage points of the difference in enforcement probabilities are due to coefficients and 14.9 percentage points are due to case mix. However, if the EU faces the same case type as the US (instead of the exact same transactions), the opposite results are generated (see Model 4A). The case mix now explains a trivial -0.9 percent of the enforcement difference, while the regime explains 16 percentage points. In effect, the National Player effect identified in the EU data implies that EU enforcement in dominance cases is less aggressive than the US policy if one considers the National Player to be identified in relative terms.

Using the alternative decomposition index, in which the coefficients are weighted by the EU case mix (in accordance with Equation 3) reveals that -18.2 percentage points of the difference in enforcement rates are due to coefficients and 33.3 percentage points are due to the case mix. (The observable difference is 15.1 percentage points.) That is, the difference in case mix accounts for more than the actual difference.<sup>50</sup> This can be interpreted as follows: (1) if not for a difference in the case mix, the US would actually enforce less often than the EU, because the contribution of the US coefficients to the gap is negative, and (2) the case mix in the US is the reason why the US enforcement rate is greater than the EU's. In fact, if the US and EU enforcement regimes were identical; we would expect to see even a larger difference between the enforcement rates than appears in the dataset, because the US enforcement regime reduces this difference. Model 4, which

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<sup>50</sup> For the EU cases the average values of the variable that measures the number of US firms, used in the predictions, is 0.27 and 0.35 for approved (closed) and enforced cases respectively (the variable ranges between 0 and 2).



includes the institutional variables (and codes EU transactions involving firms based in large EU countries as having no home court advantage in the face of the US regime), gives a decomposition in which -14.7 percentage points, of the difference in the observable enforcement probability, are due to the enforcement regime (coefficients), and therefore 29.8 percentage points are due to the differing case mix. That is, accounting for the extra factors reduces the gap attributed to the regime considerably, but it does not eliminate it. The results change slightly when the alternate coding for National Player is used.

These statistics show that, on average, the EU enforcement regime is somewhat more aggressive than that of the US when using the EU data as the weights in the analysis, but a case can be made that the US enforcement regime is more aggressive than that of the EU when using the US cases to weight the analysis (along with a “home field advantage” interpretation of the National Player variable). As both of these are only average results, we examine individual cases in more detail.

Figures 1 and 2, based on Model 4, provide such an analysis. Figure 1 reveals that in fact there are substantial differences among the individual cases. The figure plots, for the US set of mergers, the EU and US predicted enforcement probabilities for each observation against each other. The EU prediction is measured on the vertical axis (and codes mergers filed by US firms as National Players in the EU hypothetical predictions) and the US prediction on the horizontal axis. Each symbol on the graph represents one US merger. (A triangle defines an enforced matter, and a circle indicates a closed investigation.) The 45 degree line represents locations where the horizontal axis is equal to the vertical. If the EU and the US had identical predicted enforcement rates for a merger, the plotting symbol for the merger would lie on the 45 degree line. When a merger is

above the 45 degree line, it implies that the EU would have been more likely to enforce against the merger, while a plotting symbol below the line implies the opposite. (The farther the symbols are from the 45 degree line, the more different are the predictions of the US and the EU models.) As can be seen, the observations scatter considerably from the 45 degree line, suggesting that enforcement may vary considerably on specific cases. Interestingly, many of the US cases are clustered close to the 100% probability of enforcement mark, while the range for EU enforcement for those same cases varies from 50 to 100 percent. Thus, the US regime is more aggressive on these cases. Further examination reveals that this result is driven largely by high values for the entry and evidence variables.

Figure 2 presents analogous information, but from the perspective of the EU cases. The scatter plot shows the tendency of the EU model to predict higher enforcement probabilities given the EU data, as most of the marks reside above the diagonal, with the exception of the cases in which the US enforcement probabilities are close to 100 percent (the EU can only match and not materially exceed enforcement probabilities approaching 100 percent). On balance, the cases seem to confirm that EU enforcement policy is more aggressive than US policy for the historical mix of EU cases.

### C. Focusing on Differing Criteria

In the previous subsection, there was some evidence that, on average, the EU has a stricter dominance enforcement regime than the US, for most types of matters in the dataset. We now examine in more detail how the regimes focus on different criteria and how, for some types of mergers, the US actually has a stricter enforcement regime than the

EU. These computations are also limited to EU and US cases with market dominance as the relevant theory.

Figures 3 and 4 focus on the likelihood of enforcement as share varies, as predicted by Model 4 for both the EU and US. Figure 3 uses the US data, and Figure 4 uses the EU data. In Figure 3, two different EU predictions are used, based on the two hypothetical situations discussed in section VII A (*i.e.*, each regime faces (1) the same exact cases or (2) the same type of cases as the other) and the corresponding treatments of the *National Player* variable. Although neither policy is clearly driven by post-merger market share, for purposes of comparison, we organize the hypothetical enforcement probabilities of each US merger based on that transactions post-merger market share. The procedure generates 88 points for each of the regimes when using the US data. For clarity, we do not show the points on the diagram. Rather, we use a nonparametric regression to plot the average predicted enforcement at each share value separately for the EU and US models. Figure 3 shows that had the EU faced the exact US cases, the EU would have implemented a stricter enforcement policy, for cases with combined market shares below 75 percent. The US predictions increase at a higher rate and surpass those of the EU at about the 75 percent share level. Thus, for high values of market share, the graph suggests that the US policy is more aggressive. Again, this result is not surprising, given that the high values for the US entry and evidence variables will increase the probability of enforcement associated with the US structural variables to near certainty for mergers in highly concentrated markets.

If, however, we assume that EU faced the same type of cases as the US (so that a national player in the US would be viewed as a national player in the EU), Figure 3 shows that the US regime is more aggressive than the EU for all levels of post-merger market

share. This result is caused by the heavy representation of US firms in the data. Were the EU to face so many national players, it would implement a more relaxed enforcement regime than that of the US.

The analogous exercises are applied to the EU data, in Figure 4. The results show that the US would have enforced less strictly, for all levels of market shares. The differences appear to range between 10 and 20 percentage points. This result holds whether we assume the US faces the same exact cases or the same type of cases as did the EU regime.

The data analysis illustrates the fact that neither regime is universally more aggressive than the other. For some potential cases, the EU regime would enforce more aggressively, while for other potential cases, the US regime would be more active. Both situations have support in the empirical data, depending on the specific types of cases.

That said, it is still possible to generate a policy simulation to identify the potential for differences in policy. In the following, we basically set the National Player variable to zero, effectively assuming this effect passes into history. In addition, we will also (1) set the Enforcement Regime variables to zero, (2) assume that the relevant markets are not worldwide, and (3) assume that the facts do not support findings of buyer sophistication or vertical issues.

Table 8 provides this policy simulation. The table presents results from computing simulated enforcement probabilities for Model 3 using the relevant parameters in Tables 4 and 5 and specific values of the structural and evidence variables. For the US, Model 3 generates superior results, because the institutional variables included in Model 4 are

probably not appropriate for the US regime.<sup>51</sup> In contrast, the same statement cannot be made for the EU, as the Model 4 coefficients appear to represent the historical EU regime. However, the predicted values for Model 4 (with the institutional variables set to zero) approximate the predictions computed from the Model 3 coefficients in all but the easy entry case. For easy entry, the Model 4 enforcement prediction is roughly 15 points lower than that of Model 3. In effect, Table 8 allows a comparison between the historical US policy and the historical EU policy without the complication of the National Player effect.<sup>52</sup>

To create representative values for the structural data, the EU and US datasets were first divided into three sub-samples: one for mergers with 2 significant rivals, another for mergers with 3 significant rivals, and a third for mergers with more than 3 significant rivals. For the different counts of rivals, medians were computed for the two share variables (*Share-1* and *Share-2*), using both the US and EU data subsets. The median share values for the dominance cases were similar across the EU and US samples for sub-samples with two, three and four rivals, so choosing numbers for the comparison was relatively simple.<sup>53</sup> Because the EU model required values for the post-merger market share and the share of the smaller entity, the two share figures were added together to compute the post-merger share. The EU values used in the calculations are 82 and 24 percent when the number of rivals is set to two in the US model, 60 and 20 percent when the US enforcement is predicted from an assumption of three rivals, and 50 and 18 percent

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<sup>51</sup> In Model 4, two of the three institutional variables fail standard hypotheses tests and thus the evidence does not suggest that these coefficients differ from zero. The Pitofsky effect is significant, but it has an implausible sign. Moreover, Appendix C shows that the implausible Pitofsky effect is not robust to the specification of the model. Therefore, we do not use Model 4 in the simulation.

<sup>52</sup> To keep the presentation tractable, the values for the analytical and institutional variables are set to zero. The interested reader can create their own simulation by relaxing these assumptions.

<sup>53</sup> The US median shares for the merging parties are 58 and 28 percent for two rivals and 40 percent and 19 percent for three rivals, while the EU medians are 58 and 20 percent for two rivals and 40 and 20 percent for three rivals. For four or more rivals, the US medians are 32 percent and 15 percent, while the EU medians are 34 percent and 17 percent.

when the number of rivals is set to four in the US model. Computations are made for each possible entry value (zero to three) and for two values of the *Evidence-Anticompetitive* index (either zero or one). Both sets of values were transformed with the log function.

A close look at the table shows that the US regime generally is more aggressive for the matters raising the most serious concerns, while EU enforcement is more aggressive for the matters raising the least serious concerns. The cases associated with the middle ground are mixed. US enforcement probability predictions generally exceed the EU predictions when two rivals exist, with evidence on entry barriers, along with three rivals and three entry considerations. In contrast, for cases in the middle of the table (*i.e.*, three rivals with one or two entry impediments or four rivals with two or three entry impediments) the US predictions are higher when the evidence variable is set to one and lower when it is set to zero. Finally, for easy entry cases, the EU predictions are noticeably higher than the US predictions.

Findings of entry and evidence supportive of a concern generally trigger a higher US increase in enforcement probability. This result highlights the relative importance of effects evidence in the US enforcement decision. To the extent that future EU policy focuses more on non-structural variables like entry conditions and evidence suggestive of anticompetitive effects, this difference could be reduced.

As a bottom line, this comparison of enforcement regimes shows the EU to be more aggressive than the US for the structurally weak cases, but the US to be more aggressive for the structurally strong cases. Another way to phrase this is that the US model is more responsive to the three sets of variables: the relevant structural variable (market shares or

number of rivals), the entry barrier variable, and the variable that measures anticompetitive evidence.<sup>54</sup>

#### D. How Often Do the EU and US Agree?

The preceding subsections concentrated on measuring the differences in the EU and US enforcement rates. Our final analysis measures how often the EU and US would be expected to agree on the enforcement outcome (*i.e.*, either both enforce or both close). This analysis is similar to that in Lévêque (2005), except that our analytical process allows us to look at actual overlaps and include non-overlapping matters.

Our method is simple. We calculate the probability distribution of the number of agreements and, from it, the expected number of agreements. There are 88 US dominance matters, each with a different probability of agreement between the authorities. To obtain a single value for the expected number of agreements, we simulate the distribution. For each US matter, we generate a hypothetical EU outcome (either enforce or close) according to the probability predicted by Model EU4 (*e.g.*, if the EU prediction is 63 percent, we assign the hypothetical outcome as enforce with a 63 percent probability).<sup>55</sup> Using these hypothetical outcomes, we calculate the number of times the EU would have agreed with the US on the 88 matters. We repeat this simulation 10,000,000 times and report the average as the simulated value of the expected number of agreements.

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<sup>54</sup> Measurement error in the explanatory variables may cause *attenuation*, *i.e.*, downward bias of the parameter estimates; see Edgerton and Jochumzen, 2003. This would make the EU model less responsive to changes in explanatory variables that are measured with error. Given the difficulties in collecting data for this study and the potential for error, the results should be interpreted with caution.

<sup>55</sup> Note that the relevant hypothetical prediction is that in which the US gets the exact same case as the EU, not the same type of case.

Using this method, we estimate that, on average, the EU would have agreed with the US in 68.7 of the 88 (78.1 percent) matters. In the same manner (using EU data), we compute the expected number of times that the US would have agreed with the EU's outcome on its mergers. This value is 54.7 out of the 96 (57.0 percent) matters.

In Lévêque's sample of overlapping cases, he finds that the EU and the US came to the same conclusion in 52 out of 75 matters (69 percent). Our predictions are similar in magnitude to his, though they do differ. Specifically, we show that the two authorities are somewhat more likely to agree on US matters, but less likely to agree on EU matters. A plausible explanation for the lower agreement on EU matters is that the EU may be less systematic when collecting and reporting information on entry barriers and economic evidence on anticompetitive effects. Conversely, these variables are very decisive and measured carefully in the US, and the positive impact of them on EU enforcement would tend to make the EU more likely to agree with the US in US matters where barriers and evidence are present.

## **VIII. CONCLUSION**

Merger enforcement policies in the EU and the US exhibit important similarities and also some substantial differences. The most obvious difference is the historical EU focus on dominance cases, coupled with limited interest in collusion and no ability to challenge generic unilateral effects matters. In contrast, the US shows interest in all three types of cases. The 2004 revision of the EU merger regulation creates the potential for a full convergence in enforcement policies, since the new rules enable the EU to pursue collusion and generic unilateral effects cases in a manner comparable to that used in the US. It is too



soon to determine if the EU will exercise this new flexibility and enforce in the same manner as the US in these areas.

Certain similarities in the dominance/dominant firm policies exist. Although the EU and US address these concerns with different approaches (under the labels “market dominance” and “dominant firm,” respectively), the bottom line policies are relatively similar. We find that mergers creating very large leading firms tend to be challenged, while mergers slightly increasing the market position of the leading firm tend to be allowed. Mergers in market exhibiting strong evidence on impediments to entry appear more likely to be challenged, while merger in markets with easy entry are significantly less likely to raise antitrust concerns.

Our decomposition analysis shows that the EU enforcement regarding dominance is an average of 15 percentage points more aggressive than the US policy, when focusing on the EU cases. Focusing on the US cases, our results depend on how the National Player effect is interpreted. If a direct comparison of cases is undertaken, the two regimes are virtually identical. However, if specific types of cases are compared, holding the National Player concept constant over the simulation, we find the predicted US enforcement rate is 16 percentage points higher than the comparable value for the EU. It is impossible to clearly conclude that one regime is generally more aggressive than the other. They are just different.

A simulation analysis elaborates on the “just different” conclusion. For the strongest dominance cases (mergers to monopoly or duopoly in markets protected by solid barriers to entry), the general US policy is more aggressive than the EU policy. On the other hand, for marginal dominance investigations, the EU policy reports a higher

challenge probability. In either case, special case situations (buyer sophistication or vertical issues in the US and National Player status in the EU) could flip these results. Thus, the models allow a comparison of the policies on a case-by-case basis, but generalization is risky.

Looking closely at the results of the two models allows us to observe additional differences. The EU regime appears to respond to institutional considerations, while the effect of these factors on US enforcement is less clear. For example, the variable for a merger partner coming from Big-5 EU nations reduces the probability of enforcement, while deals reviewed under Commissioner Monti faced a higher risk of enforcement compared to other deals filed in the EU. Revisiting these results in a few years would be useful, because these institutional responses may be related to a transitional policy. In contrast, the US regime seems more affected by analytical and evidence variables measuring customer sophistication, vertical integration, and evidence associated with anticompetitive effects. These results are compatible with the legal structure of US enforcement, as the FTC (or DOJ) may have to prove its case in some type of court to block a merger, while the EU only needs to defend a decision to block a merger in court if challenged by the merging parties. However, the 2004 EU reforms, with new requirements to collect evidence to show that competition is impeded, may reduce this difference over time.

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Table 1 – Overview of the Explanatory Variables

Variable	Definition	Sign	Range EU	Range US
Share-1	Larger share of two firms involved in merger	+	5.5/95	10.6/91.8
Share-2	Smaller share of the two firms involved in merger	+	1/50	2.0/50
Post-merger MS	Post-merger share of parties; computed by adding pre-merger shares of the merging firms	+	10.5/100	12.9/100
Post-merger HHI	Herfindahl Index computed by summing the square of market share held by each firm in the post-merger market	+	1450/10000	1049/10000
Change-HHI	Increase in Herfindahl Index from merger	+	55/5000	48/5000
Rivals	Number of pre-merger “significant” rivals in market affected by merger	-	1/6	2/16
Entry Index	Index for findings of timeliness, likelihood or sufficiency impediments to entry; 0 implies easy entry, 3 is most difficult	+	0/3	0/3
Buyer Sophistication	Indicator variable to identify cases in which buyer power was found	-	0/1	0/1
Vertical Issues	Indicator variable to identify cases in which vertical aspects of merger were considered	?	0/1	0/1
Evidence Anticompetitive	Index of anti-competitive findings associated with customer complaints, hot documents or historical natural experiments; 0 implies no such findings, 3 means all three factors reported.	+	0/2	0/3
National Player	0, 1 or 2 US firms involved in merger in the US data; and 0, 0.5, 1, 1.5 or 2 Big-5 EU firms involved in merger in the EU data	(-)	0/2	0/2
Enforcement Regime	Indicator for Monti era leadership in the EU data and Pitofsky era in the US data	(+)	0/1	0/1
World Market	Indicator for worldwide geographic market	+	0/1	0/1
Unilateral Effects	Indicator variable to identify cases reviewed by EU under market dominance or the US with unilateral effects	+	0/1	0/1

a. Sign predictions are in parentheses when applied to only one enforcement regime. Big-5 EU firm means a firm headquartered in France, Germany, Italy, Spain, or the UK. For details on the coding of National Player see Appendix B.

Table 2 – Means of the Explanatory Variables - Full Sample

	EU		US	
	Enforce	Close	Enforce	Close
Share-1	47.1	39.8	-	-
Share-2	23.1	15.0	-	-
Post-merger MS	70.2	54.8	68.6	42.6
Post-merger HHI	5824	4113	5932	3113
Change-HHI	2137	1192	2031	811
Rivals	2.91	3	2.91	5.31
Entry Index	1.19	0.64	2.11	1.14
Buyer Sophistication	.030	.089	.241	.379
Vertical Issues	.507	.444	.093	.103
Evidence Anticompetitive	.463	.178	1.17	.259
National Player	.567	1.06	1.44	1.64
Enforcement Regime	.627	.444	.546	.500
World Market	.224	.067	.083	.103
Observations	67	45	108	58

a. For the EU data set, for the variables *Post-merger HHI* and *Change-HHI*, the number of observations is 65 and 44 for enforced and closed cases, respectively. For rivals, the number of observations is 66 for enforced cases. *Enforce* means that a merger was prohibited, litigated, withdrawn in the face of a challenge, or accepted only after the parties offered substantial remedies. See Appendix B.

Table 3 – Means of the Explanatory Variables - Dominance/Dominant Firm Sample

	EU		US	
	Enforce	Close	Enforce	Close
Share-1	48.7	45.8	55.5	36.1
Share-2	23.7	15.8	24.5	17.9
Post-merger MS	72.4	61.6	80.0	54.0
Post-merger HHI	5995	4550	6974	3825
Change-HHI	2220	1402	2556	1307
Rivals	2.87	2.70	2.39	4.59
Entry Index	1.19	0.58	2.13	1.18
Buyer Sophistication	.032	.121	.282	.412
Vertical Issues	.524	.364	.113	.176
Evidence Anticompetitive	.492	.152	1.15	.355
National Player	.563	.985	1.44	1.76
Enforcement Regime	.635	.394	.606	.588
World Market	.206	.091	.084	.059
Observations	63	33	71	17

a. For the EU data set, for the variables *Post-merger HHI*, *Change-HHI*, and *Rivals*, the number of observations is 62 and 32 for enforced and closed cases, respectively.

Table 4 – EU Econometric Model Results for Enforcement Probability

	(EU1)	(EU2)	(EU3)	(EU4)
Entry Index	1.035*** (3.67)	1.023*** (3.57)	0.901*** (3.07)	1.079*** (3.51)
Post-merger MS	0.487 (1.23)	0.463 (1.17)	0.392 (0.97)	0.399 (0.99)
Share-2	0.434** (2.47)	0.433** (2.37)	0.440** (2.49)	0.419** (2.20)
Buyer Sophistication	-	-0.769 (-1.39)	-0.649 (-1.16)	-0.494 (-0.87)
Vertical Issues	-	-0.016 (-0.06)	-0.033 (-0.12)	0.199 (0.65)
Evidence-Anticompetitive	-	-	0.541 (1.22)	0.422 (0.91)
National Player	-	-	-	-0.823** (-2.13)
Enforcement Regime	-	-	-	0.772*** (2.58)
World Market	-	-	-	1.017** (2.16)
Unilateral Effects	0.789* (1.82)	0.854* (1.95)	0.824* (1.83)	0.854* (1.84)
Constant	-4.133*** (-2.93)	-4.034*** (-2.84)	-3.788*** (-2.63)	-4.108*** (-2.81)
Observations	112	112	112	112
Pseudo R-squared	0.21	0.22	0.23	0.35
Pseudo Log-likelihood	-59.76	-58.87	-58.14	-49.25

a. Dependent variable: *Enforce*.

b. Robust t-statistics in parentheses

c. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.



Table 5 – US Econometric Model Results for Enforcement Probability

	(US1)	(US2)	(US3)	(US4)
Entry Index	1.600*** (5.32)	2.120*** (5.74)	2.352*** (5.57)	2.776*** (5.38)
Post-merger HHI *Collusion	1.633*** (4.24)	1.733*** (4.13)	2.446*** (4.34)	3.138*** (4.22)
Rivals* Unilateral	-2.438*** (-4.13)	-2.862*** (-4.24)	-2.295*** (-3.74)	-2.481*** (-3.18)
Buyer Sophistication	-	-1.250*** (-3.77)	-1.150*** (-3.25)	-1.106*** (-3.00)
Vertical Issues	-	-.9469** (-2.14)	-1.052** (-2.33)	-1.421*** (-2.47)
Evidence-Anticompetitive	-	-	1.697*** (3.86)	2.048*** (4.30)
National Player	-	-	-	-.9170 (-1.46)
Enforcement Regime	-	-	-	-.9507* (-1.93)
World Market	-	-	-	.02953 (.05)
Unilateral Effects	16.59*** (5.16)	17.99*** (5.13)	22.90*** (4.99)	28.90*** (4.46)
Constant	-14.59*** (-4.61)	-15.41*** (-4.49)	-22.02*** (-4.64)	-26.92*** (-4.36)
Observations	166	166	166	166
Pseudo R-square	.457	.533	.626	.665
Pseudo Log-likelihood	-58.28	-50.16	-40.18	-35.99

a. Dependent variable: *Enforce*.

b. Robust t-statistics in parentheses.

c. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Table 6 – Probability of Enforcement for Different Sub-samples: Dominance Cases

Model Used	Overall		Enforce		Close	
	EU model	US model	EU model	US model	EU model	US model
Dominance Cases Model 3						
Portion of Correct Predictions	74.0	92.0	82.5	95.8	57.6	76.5
Average Prediction	65.4	79.8	73.5	91.8	50.1	29.6
MSE	0.173	0.0645	0.105	0.0326	0.301	0.198
Dominance Cases Model 4 (use exact same cases )						
Portion of Correct Predictions	81.3	93.1	88.9	95.8	66.7	82.4
Average Prediction	65.3	79.1	77.5	92.1	42.1	24.6
MSE	0.149	0.0563	0.096	0.0322	0.250	0.157

a. Number of observations: 88 for the US data and 96 for the EU data.

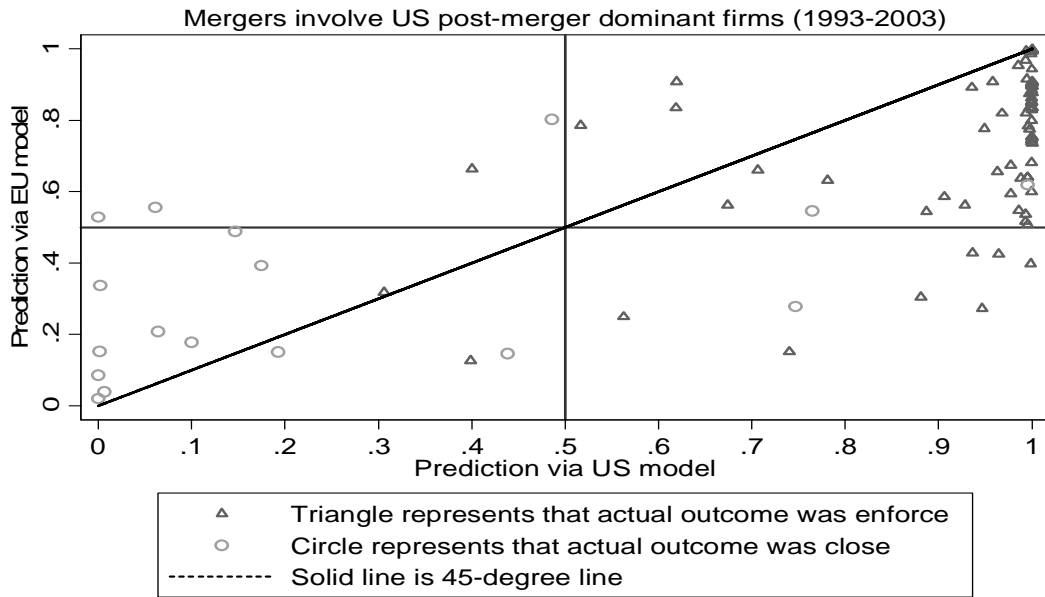
b. MSE is the mean square error of the prediction. It is computed by averaging the square of the error associated with predicting each observation.

Table 7 – Hypothetical Enforcement Rates and the Oaxaca Decomposition

	Hypothetical rate (percentage)			Actual rate (percentage)
	<u>Model 3</u>	<u>Model 4</u>	<u>Model 4A</u>	
EU regime on US mergers:	81.2	80.5	64.7	80.7
US regime on EU mergers:	47.4	50.9	50.1	65.6
	Decomposition (percentage points)			Actual difference (percentage points)
	<u>Model 3</u>	<u>Model 4</u>	<u>Model4A</u>	
Weight coefficients with US data				
Amount due to regime:	-0.5	0.2	16.0	
Amount due to case mix:	15.6	14.9	-0.9	
Weight coefficients with EU data				15.1
Amount due to regime:	-18.2	-14.7	-15.5	
Amount due to case mix:	33.3	29.8	30.6	

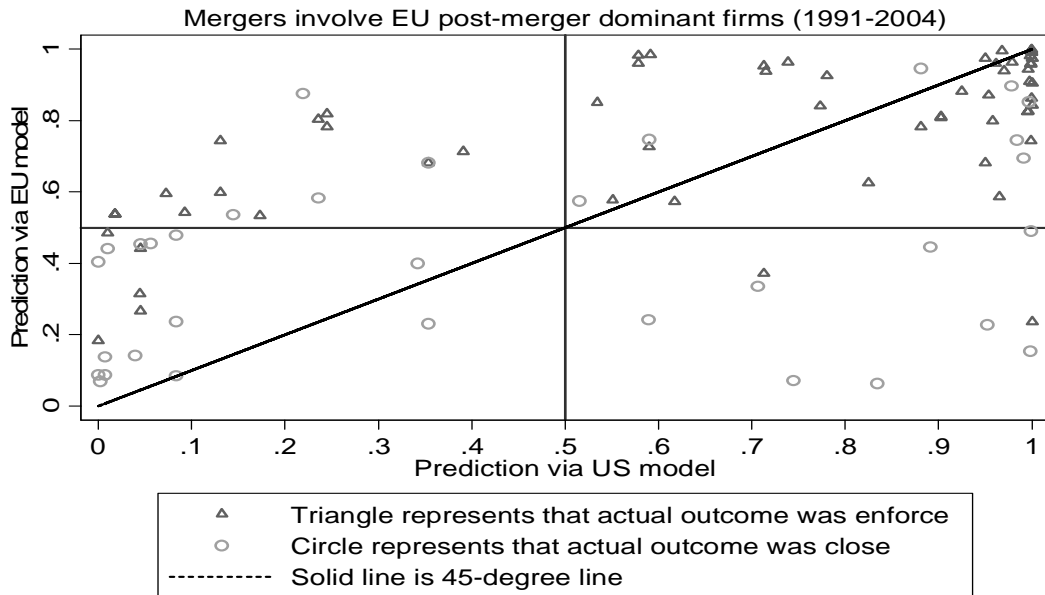
a. Number of observations: 88 for the US data and 96 for the EU data.

Figure 1 – Comparison of Predicted Outcomes, US Data



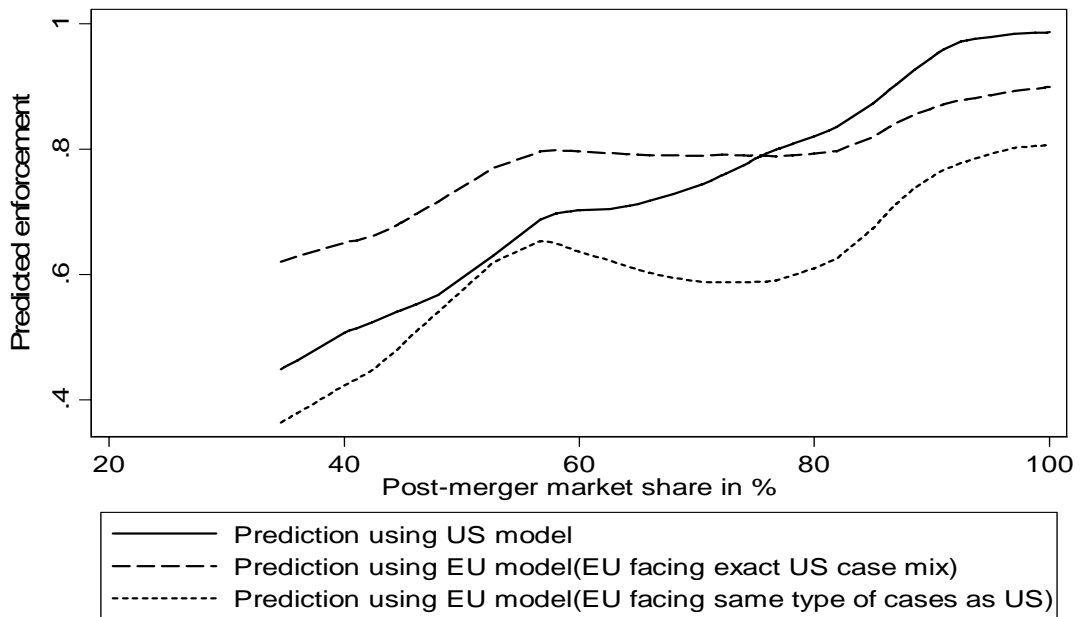
- a. Figure constructed using coefficients from Models EU4 and US4, presented in Tables 4 and 5, respectively.
- b. Number of observations: 88.

Figure 2 – Comparison of Predicted Outcomes, EU Data



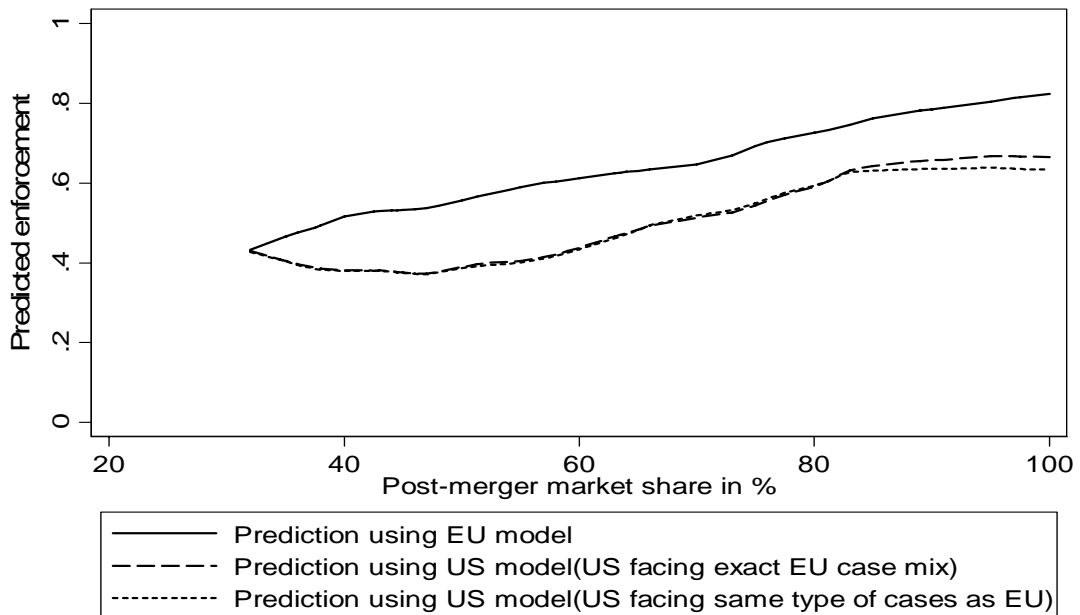
- a. Figure constructed using coefficients from Models EU4 and US4, presented in Tables 4 and 5, respectively.
- b. Number of observations: 96.

Figure 3 – Predicted Enforcement Probability vs. Post-Merger Market Share, US data



- a. Figure constructed using coefficients from Models EU4 and US4, presented in Tables 4 and 5, respectively.
- b. Number of observations: 88.

Figure 4 – Predicted Enforcement Probability vs. Post-Merger Market Share, EU data



- a. Figure constructed using coefficients from Models EU4 and US4, presented in Tables 4 and 5, respectively.
- b. Number of observations: 96

Table 8 – Comparison of Predicted Probability of Enforcement

Probability given as Percentage	Entry = 0	Entry = 1	Entry = 2	Entry = 3
EU model (Share =82, S2=24)	56.4-70.4	78.4-87.7	87.55-93.7	92.1-96.3
US model (2 rivals)	23.9-67.9	82.1-98.2	96.9-99.9	99.5-99.9
EU model (Share=60, S2=20)	48.4-63.1	72.0-83.1	82.9-90.7	88.7-94.3
US model (3 rivals )	5.0-32.1	49.6-87.8	82.7-98.3	94.7-99.7
EU model (Share=50, S2=18)	43.7-58.6	67.9-80.0	79.7-88.6	86.2-92.9
US model (4 rivals)	1.1-13.0	25.1-69.3	61.1-92.8	83.1-98.4

- a. All other values set to 0, except *Evidence-Anticompetitive*, which takes values 0 and 1, generating the two predictions in the table.
- b. The coefficients are taken from Models EU3 and US3 in Tables 4 and 5, respectively.
- c. Number of observations: 88 for the US predictions and 96 for the EU predictions.

## **Appendix A – Background on the Merger Review Processes**

The EU and the US have comparable institutional merger review systems. Under both authorities, the process follows the same three-step procedure. First, merging parties must notify the relevant governing institution, and this institution makes a preliminary assessment. Then, if required, the relevant authority proceeds with a more detailed investigation. Finally, the agency makes an enforcement decision. Table A-1 summarizes the review activity for 1990-2004. It tabulates by year and jurisdiction the number of filings, the number of detailed investigations authorized, the number of those matters that were reviewed for this study, and the count of the enforcement actions studied in this analysis.

Despite the similarity in the overall processes, the details differ substantially between the EU and the US. The EU is limited to reviewing relatively large transactions, leaving smaller deals to the member nations, while the US enforcers capture a broader range of transactions in the regulatory net. In the EU, merging parties must notify the European Commission (EC) when the combined world-wide turnover (revenues) of the two parties is at least €5 billion and if the intra-community sales of each firm is at least €250 million, unless the intra-community sale is concentrated in one member state (more than two-thirds of the turnover of each firm in the same member state).<sup>1</sup> The European Commission's legal authority is not limited by either the nationality of the merging firms or the type of market in which the firms are active. Thus, the European Commission is able to review a merger of non-European firms, as long as those firms actively sell into the EU.

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<sup>1</sup> Under an alternative threshold, the combined global revenue must be at least €2.5 billion, the intra-community revenue of each firm must be at least €100 million. Moreover, additional thresholds must be met for at least three member states.

This means that mergers between multinational firms may be evaluated in more than one jurisdiction. However, according to the “one-stop-shop” principle, the member state’s national merger regulations are not applicable when EU Merger Regulation is triggered.<sup>2</sup>

Upon notification of a merger, the European Commission must make a preliminary evaluation within 25-35 working days. This is called the Phase-1 investigation. At the end of Phase-1, the EU may close the matter and allow the parties to merge. Otherwise, if the preliminary findings indicate that the merger “raises serious doubts as to its compatibility with the common market,”<sup>3</sup> the EU may initiate an in-depth investigation. This more extensive evaluation is called a Phase-2 investigation and it extends the duration of the inquiry by 90-125 working days. At the end of the Phase-2 period, the EU issues a formal report on the merger. If the transaction is considered anticompetitive, the EU can prohibit the consummation of the merger, although most problematic mergers are resolved through the firms agreeing to an undertaking (settlement).<sup>4</sup>

As of December 31, 2004, Phase-2 investigations had been initiated in 141 cases (see Table A-1).<sup>5</sup> Of these Phase-2 cases, 19 were blocked. In another 23 cases the parties withdrew the notification before the final decision. Twenty-five cases have been approved without remedies, and, in 71 additional cases, the merger was cleared in the second phase only after the parties had committed to some type of remedy (*e.g.*, the sale of overlapping

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<sup>2</sup> On its own initiative, or at the request of the parties, the EU can make a partial referral of a merger case to one or more member states.

<sup>3</sup> See Article 6 of the 1989 and 2004 versions of the EU Merger Regulation, referred to in footnotes 16 and 23, respectively. On occasion, parties may offer undertakings sufficient to resolve the EU’s competitive concerns and avoid the Phase-2 process.

<sup>4</sup> The firms involved in the transaction can challenge the prohibition in court.

<sup>5</sup> In about four per cent of the notified mergers, the EU accepts remedial commitments already during the first phase. This makes the Phase 2 review unnecessary. These matters are not coded.



activities).<sup>6</sup> For 30 of these cases, the commitments were not structural in nature but rather addressed behavioral or other activities that did not remove all the horizontal overlap.

A major difference between the EU and the US is that the latter has two independent antitrust bodies, the DOJ and the FTC. Both have authority to regulate mergers. A clearance process ensures that only one agency looks at any given transaction. The discussion on filing and second request data is valid for both bodies, although the analysis in this paper is limited to the FTC cases, as only those files were available to the authors.

Three conditions determine if a merger must be reported to the FTC.<sup>7</sup> First, the parties must be engaged in commerce, and hence purely financial transactions are not reportable. Second, the value of the stock or assets acquired must exceed the “size-of-transaction” threshold. For 2004, this value was \$50 million.<sup>8</sup> Third, for small transactions (in 2004, transactions valued at less than \$200 million), the firms have to exceed the “size-of-person” thresholds (in 2004, this threshold was met when one party had sales or assets above \$100 million and the other over \$10 million). Like the EU, the US can review transactions even when the assets involved in the merger are located outside the US.<sup>9</sup> Foreign-based firms face the same requirements as US firms, but only their US sales or operations trigger filing obligations. In contrast to the EU, the 50 states can investigate mergers simultaneously with the federal government. However, the costs of a major antitrust investigation limit the activity of the local regulators, so states are most likely to

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<sup>6</sup> For three of the 141 cases, the European Commission had not yet reached a formal decision when the data were collected.

<sup>7</sup> For the full details, see, <http://www.ftc.gov/bc/hsr/introguides/guide2.pdf>.

<sup>8</sup> Starting in 2005, the FTC was required to increase these filing thresholds over time. For the 2006 increase, see, <http://www.ftc.gov/opa/2006/01/fyi0603.htm>.

<sup>9</sup> See sections 802.5, 802.51, and 802.52 of the Hart-Scott-Rodino regulations for the details.

take an interest in mergers with local effects such as those in the retailing sector. Table A-1 reports that there were almost 37,000 relevant filings for fiscal years 1990 to 2004.<sup>10</sup>

Once a transaction is filed, the US enforcement agencies generally have 30 days to review the matter. If the competitive concerns cannot be resolved in this initial waiting period, the antitrust authority issues a second request, which is a detailed request for more information.<sup>11</sup> The merger is then usually delayed until 30 days after the parties have substantially complied with the second request (this deadline is often extended by agreement). To formally block a transaction, the enforcement agency must obtain a court order, although in most matters, concerns are resolved through settlements.

A total of 1,188 second requests were issued by either the DOJ or FTC during the 1990-2004 time periods.<sup>12</sup> Some of these were withdrawn prior to the completion of the investigation, and others were blocked or restructured by enforcement action. While enforcement data are maintained on a fiscal year basis (making exactly matching up investigations with challenges difficult), a rough calculation suggests that over half of the second request investigations led to some type of enforcement action.

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<sup>10</sup> The FTC can investigate unreported transactions, often after consummation. These investigations, although few in number, are not reported in Table A-1.

<sup>11</sup> In the EU, the notifying parties are required to provide extensive documentation when the merger is filed. Although the European Commission can ask for more information at a later stage, this option is not always used, and typically the bulk of the information is provided at the date of notification. In the US, the information required at notification is not substantial, while the second requests usually require an immense amount of data. Hence, the notifying firms have a higher initial information burden in the EU. On the other hand, the turnover (revenue) thresholds for notification are much higher in the EU and thus the EU would not require detailed information from as large a number of filings as would be needed for the US.

<sup>12</sup> Applying an approximation of EU's turnover threshold to the 166 FTC mergers used in this study suggests that roughly one-fourth of the transactions would be reportable had the transactions occurred in Europe. If this estimate is representative for the rest of the sample, approximately 300 of the US cases would be reported under the EU standards. This is a very rough estimate, because the 166-case subsample is not a random sample of US second requests.

Table A-1 – Overview of the Merger Review Process

	Notifications		Phase-2/Second Request		The Sample		Challenged Cases	
	EU	US	EU	US	EU	US (FTC)	EU	US (FTC)
1990	12	1955	0	89	0	NA	0	NA
1991	63	1376	6	64	4	NA	1	NA
1992	60	1451	4	44	4	NA	2	NA
1993	58	1745	4	71	2	19	1	9
1994	95	2128	6	73	4	25	1	14
1995	110	2612	7	101	7	26	3	15
1996	131	2864	6	99	5	12	3	7
1997	172	3438	11	122	6	21	4	15
1998	235	4575	12	125	11	10	6	9
1999	292	4340	20	113	13	16	10	10
2000	345	4749	19	98	18	9	14	8
2001	335	2237	22	70	19	7	11	5
2002	279	1142	7	49	7	13	4	11
2003	212	968	9	35	7	8	4	5
2004	249	1377	8	35	5	NA	3	NA
Total	2648	36957	141	1188	112	166	67	108

a. Challenged cases for the EU = prohibitions + cases withdrawn in Phase-2 + cases approved with structural remedies. Challenged cases for the FTC = litigated cases + structural settlements + abandoned transactions in which challenge decision had been effectively made.

b. Sources: homepage of DG Comp, European Commission (<http://www.europa.eu.int/comm/competition>) and homepage of FTC (see, <http://www.ftc.gov/os/2001/04/annualreport2000.pdf> and, <http://www.ftc.gov/reports/hsr05/050810hsrrpt.pdf>). FTC data are provided for the fiscal year.

c. US sample is limited to the horizontal merger investigations at the FTC that (1) involve 1-3 markets of concern and (2) underwent a full investigation. Notifications and Second Requests include both FTC and DOJ data.

d. NA – not applicable as files in these years were not used in the study.

## **Appendix B – An Overview of the Data Collection Process**

The data collection process for this paper started with files available from three recent papers: Bergman *et al.* (2005), Coate and Ulrick (2006), and Coate (2005b). These papers collected different variables, consistent with the fact that the papers studied two different enforcement regimes. To aid the comparison of the regimes, the present paper analyzes similar variables for both authorities, and thus we gathered additional data from the European Commission and the FTC. This appendix presents the details on the data collection process for both, with the first subsection giving an overview of the process. The last two subsections review the coding methodology for the variables, focusing first on the dependent variable and then on the independent variables.

### Overview

The data collection process differed slightly for the EU and the US. The EU dataset was designed to include all of the Phase-2 mergers reviewed between September 1990 and December 2004. The initial population of 141 cases was reduced for a number of reasons. In three of the cases, a formal decision had not yet been published at the time the data were collected. An additional eight cases did not contain enough information for them to be used in the analysis, because they were withdrawn prior to the Statement of Objection (the preliminary decision, which is sent to the parties about a month prior to the formal decision). Two additional cases were missing some or all of the information needed for our analysis. Finally, sixteen cases (mergers with primarily vertical or potential competition concerns) were dropped from the sample to focus the analysis on horizontal mergers. As

noted in Table A-1, the resulting data set includes 112 horizontal merger cases.<sup>1</sup> Many mergers led to competitive effects in more than one market. The data collection process identifies the market with the most serious competitive concerns and collects data only for that market.

For the US, Table A-1 shows that slightly less than 1,000 second requests were issued in the 1993-2003 sample period. However, roughly 430 of them were issued by the FTC (the rest were issued by the DOJ). The memoranda for these mergers were reviewed and organized for an earlier research project. Roughly 20 percent of the FTC's matters were not straightforward horizontal mergers and thus were discarded. Thirty-eight percent of the remaining horizontal investigations were excluded from the dataset, because they were quickly resolved (*i.e.*, the parties either withdrew the filing at an early stage, or the staff quickly closed the investigation) and thus only limited information was available for them. The sample also contained numerous transactions in which multiple markets were involved. Following Coate and Ulrick (2006), these files were dropped from the study, because the information provided in the relevant memos is not always sufficiently detailed to obtain all the data required for the analysis. Finally, three files that would otherwise be in the sample were lost to the ravages of time. The final sample contains 166 matters. To focus the analysis, the most problematic concern associated with each merger was selected for detailed review.

The bulk of the European data were collected from the EU home-page by two student-researchers under the direction of the European authors.<sup>2</sup> For the few withdrawn matters, the EU authors recovered the information from the confidential files maintained in

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<sup>1</sup> In the simulation analysis the 16 collective dominance cases were dropped, and only the 96 single dominance cases were used.

<sup>2</sup> Complex cases were double coded, while simple cases were coded by only one researcher.

Sweden by the Competition Authority. In reviewing the files, it was clear that some of the variables could be coded objectively, such as the nationality of the merging firms or the notification date. The coding of other variables, such as entry barriers and buyer power, was more subjective, because it involved interpreting the decision text. The objective variables were easy to record, while the subjective ones required some judgment as detailed below.

For the 166 FTC cases, the formal (confidential) memoranda written by the Commission staff at the end of the investigation were reviewed by teams of research assistants, and the two sets of results checked for consistency by one of the authors. In light of the structure imposed on the merger review process by the US Merger Guidelines, the bulk of the data were relatively easy to record. This Guidelines structure often transformed subjective analysis into an objective search for facts consistent with Guidelines principles. Only the evidence variables (the presence or absence of customer concerns, hot-documents, and evidence of adverse market effects from previous natural experiments) required careful subjective analysis, as the Merger Guidelines focus more on outlining a competitive concern than proving a case.

#### The Outcome of the Merger Review Process

The dependent variable can be treated as a binary indicator, because the outcome of an FTC or EU investigation is to either bring an enforcement action or close the case, given our definition of those two categories. In the EU dataset, we code the outcome variable as zero for cases that are closed (mergers that were allowed) without any or with only minor commitments by the merging parties. We code blocked (prohibited) mergers as one. Many

transactions are approved only after heavy commitments are made by the parties. We view such outcomes as prohibitions, because, without the commitment, the Commission would have prohibited the transaction. We thus code the outcome of these transactions as enforcement actions (*i.e.*, the dependent variable equals one). For similar reasons, cases withdrawn in the EU during the second phase investigation, after the Statement of Objection, are coded as enforcement actions as well.

The FTC follows a similar procedure. Many investigations involved the formal termination of the merger review process, without any FTC action. Such cases are coded as zero in our data. A few matters end in settlements that address ancillary concerns to the horizontal merger agreement. These cases are also coded as zero, because the merger at issue was consummated without any structural change in the market. Most investigations are resolved with some form of horizontal divestiture agreement, in lieu of a court challenge. Other matters are abandoned when the parties are informed of the likely merger challenge. A few filings lead to litigation in Federal court. In all the matters in which the structural effect of the merger was mitigated (structural settlement, merger abandoned in face of challenge or litigation), the outcome is coded as an enforcement action.

The challenge decisions contained sufficient information to code the theory of concern thought to underpin the challenge or close decision. In the EU, there were two possible anticompetitive theories: single firm dominance or collective dominance (collusion). In most cases, only one theory was investigated. In other cases, however, both theories were addressed, although the analysis focused on the most relevant theory. In the US, the Merger Guidelines also defined two choices: coordinated interaction (collusion) and unilateral effects. The FTC files often addressed both theories, but it was usually

obvious which theory was the most relevant. Files that concentrate on both theories of concern are carefully studied to determine which theory is the most relevant.<sup>3</sup> For both sets of data, we record an indicator variable associated with the application of a unilateral effects theory. Below, we discuss how market share data allowed the further subdivision of the unilateral effects category into dominance and non-dominance matters. This classification allowed a comparison between the EU and US policy on dominance/dominant firm mergers.

#### Explanatory Variables for the Merger Review Process

For both data sets, the review started with the core structural variables. The EU models and previous papers used market share (with the shares of the two merging entities readily available), while the US model and previous papers used the Herfindahl index and the number of significant rivals (with the change in the Herfindahl also tabulated). To aid our comparison, share data were collected for the US data, and information on Herfindahl, its change and rivals was collected for the EU. In most files, pre-merger market share of the merging parties could be readily recorded. However, in some EU matters, the exact share figure was not available due to confidentiality concerns, but instead the file contained a range. In such cases, we chose the midpoint in the range to represent the market share of the party. The files were also reviewed to identify the number of pre-merger significant competitors in the investigation. Competitors with a market share of 10 percent or more were considered to be significant. Further, in cases with only two active firms in the

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<sup>3</sup> The identification of a clear collusion analysis (*e.g.*, the Maverick model) led the analysis to accept the collusion model as relevant. A higher number of rivals, homogeneity of the product, and the scope of information in the market also supported the choice of the collusion model.



market, both firms were considered to be significant.<sup>4</sup> Finally, both merging firms were coded to be significant, even though the share of the target firm was below the 10 percent limit, if that firm had a market share larger than the other fringe firms in the market.<sup>5</sup> The information on market shares together with share data for other firms was also used to calculate the Herfindahl index, along with the change in the Herfindahl.

The US analysis involved two complications. First, the standard structural variables (Herfindahl, change in Herfindahl, and number of significant rivals) were often presented in both the attorneys' (BC) and the economists' (BE) memoranda. While these numbers were usually comparable, differences did exist. Since we observed differences in the BE memo that were usually either (1) not material or (2) reflected in some other variable in the generic analysis (and thus would be accounted for later in the review), the analysis focused on the BC concentration figures. Second, the US generally does not systematically define a dominant firm. We considered dominant firms to be those that would (1) hold the largest position in the post-merger market and (2) be at least 10 percent larger than its closest rival. For this subset of matters, the two special share-specific variables were computed: one recording the larger share held by one of the merging parties and the other focusing on the smaller share. Together, these numbers define the post-merger share. This review of the files identified six structural variables (*Post-merger Share*, *Share-1*, *Share-2*, *Post Merger HHI*, *Change-HHI*, and *Rivals*).

Entry considerations were the next most important variable. Although it would be relatively easy to review the files and measure clearly defined barriers to entry as a binary

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<sup>4</sup> As the concept of significant rivals is more developed in the US enforcement regime, it was usually possible to obtain a count of the number of rivals from the files. Simple rules were used when the memos did not delineate rivals.

<sup>5</sup> In the EU, a few matters involved a dominant firm acquiring one of the fringe firms, and therefore only one significant rival was identified.

variable, the Coate and Ulrich (2006) study suggested the use of a more complex proxy based on the three entry impediments identified in the Merger Guidelines (*i.e.*, barriers to timely, likely, or sufficient entry). The proxy counts the number of these barriers, and thus ranges from zero to three. For example, if the relevant staff memo identifies a concern about timeliness of entry but states that entry is likely and would be sufficient, the *Entry Index* is set equal to one. If the memo indicates that entry is likely but would be neither timely nor sufficient, we set the proxy equal to two. In creating the proxy variable, we acknowledge the presence of a timeliness, likelihood, or sufficiency barrier when the staff explained why the respective consideration would represent an impediment to entry. For example, an impediment to timeliness is acknowledged if staff noted that entry required more than two years to affect the market. As this structure is followed in the US, but not in the EU, we had to fit the discussions on entry barriers in the EU decision text into these three entry-related categories.<sup>6</sup> When the discussion on entry barriers did not fit into the structure, entry barriers were coded as not reported. This is possibly a source of downward bias in the EU estimations and this issue is addressed in Appendix C. The possible values for the EU *Entry Index* included the integers from 0 to 3.

There is a caveat to the creation of the entry variable in the US data, because the FTC has memos from both the economists and attorneys. Entry proxies were created for both BC and BE memos by coding the staff findings on the three Merger Guidelines considerations of timeliness, likelihood, and sufficiency of entry.<sup>7</sup> This evidence was summarized in two entry indices, each ranging from 0 to 3. The study averaged the two

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<sup>6</sup> The three-part test of timeliness, likelihood, and sufficiency of entry is an empirical implementation of the theoretical concept of entry barriers. One would expect standard barrier arguments could be cast as suggesting entry is not “likely.”

<sup>7</sup> If a standard, based on an evidence finding by either staff, was used to code the entry variable, the resulting index would approximate the result generated by a simple review of the attorney memos.

variables to create a single *Entry Index* proxy that ranged from 0 to 3, but could take on half unit values.<sup>8</sup>

We searched the files to create a binary *Buyer Sophistication* variable. In the EU data, we coded this variable as one if the European Commission found there might be sufficient buyer power present in the relevant market to likely offset the increase in seller market power. In the US, buyer sophistication was coded as a one when staff analysis (either BC or BE) recognized (at least implicitly) that the customers had the potential for strategic behavior that might possibly serve to maintain a competitive equilibrium. While cases of classic buyer power (a large share of the market held by few buyers) led to sophistication findings, buyers were not required to dominate the supply side of the business to generate a positive coding. Instead, buyers were considered sophisticated when the investigational record suggested buyers had taken (or could take) actions to enhance competition in the market.

For both the EU and US data, we coded the *Vertical Issues* indicator as one if the merger review found vertical issues to be relevant. In some mergers, the discussion addressed upstream or downstream markets that could be affected by the merger. In effect, these considerations suggest that the transaction will reduce the use of a market and increase the use of internal arrangements to serve final consumers.

Following the modeling discussed in Coate (2005b) and Coate and Ulrick (2006), we created an evidence proxy that aggregates findings of validated customer concerns, hot documents, and historical events suggesting the merger would lead to less-than-competitive behavior. Specifically, the proxy summed three binary indicator variables denoting the

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<sup>8</sup> Numerous other weighting schemes are possible, but all present basically the same analysis: high values when the entry evidence is strong, marginal values, when the entry evidence is weak and a value of zero when entry is considered easy.

presence of each of the three types of evidence. The first of these addressed customer complaints. The standard investigation often recorded and evaluated the opinion of the customers. If the text reporting this opinion clearly implied a competitive concern stemming from the merger, the variable was set to one. If no concerns were recorded, or the text explained away the complaints (either by noting they were misplaced or by observing other important customers held opposite opinions) the variable was coded as zero. As the value of the index turned on the interpretation of the complaint, generic opposition to mergers would not be sufficient to trigger a concern. This variable was relatively easy to identify in both the EU and US matters (using both BC and BE files).

The second variable in the proxy focused on hot documents, defined as documents written by the merging parties predicting the consummation of the merger would lead to direct or indirect anticompetitive effects. The observation was generally linked to a price effect following the consummation of the merger, but documents were also coded as hot when the text could only be read to suggest higher prices would result from the merger. Documents noting close competition between firms were not considered hot, because the loss of this competition might not allow higher prices. Our review found the hot document variable was more likely to be found in the FTC analyses.

The third variable in the index identified past natural experiments that appeared to have affected the market of concern (or a closely related one). Here, the files were reviewed for discussions of evidence that implicitly tests the viability of the specific theory of concern. For example, in a unilateral effects investigation, evidence that an entrant significantly lowered the market price would support the hypothesis that the loss of that entrant via a merger would lead to higher prices. Alternatively, under a collusion theory,

evidence linking poor performance to market concentration would support the hypothesis that further concentration caused by the merger would lead to higher prices. When this type of evidence was recorded in the files, the event variable was set to one. Again, events were much more likely to be addressed in the US matters. For both the EU and US, these three variables were aggregated together to form an evidence index (*Evidence-Anticompetitive*) that ranged from 0 to 3.

Finally, we coded a number of institutional variables. These variables addressed specific factors that might affect one or both of the enforcement regimes. The first focused on the nationality of the firms involved in the merger. This was defined by the location of the notifying firm's headquarters. In the EU, the variable was coded to identify firms from the five largest EU nations, while for the US, the variable identified US firms.<sup>9</sup> For the EU, more than two firms were often involved in the mergers, therefore the national player status of each merger averaged, when necessary, the status of the multiple filing entities associated with either the acquiring or acquired firms (*e.g.*, a merger with one out of two acquiring firms and one out of two acquired firms from a large EU country would be coded as a half for the acquiring firm and a half for the acquired firm). The two fractions were added to obtain the relevant *National Player* index bounded by 0 and 2. For the US, the index was much easier to compute, because each merging party generally has only one parent entity with a filing obligation. Thus, the *National Player* variable defined the number of US parents (zero, one or two). In both the EU and US, transactions involving two non-favored companies were coded as zero.

The second institutional variable focused on domestic politics. In the EU, we coded the *Enforcement Regime* as one for decisions taken under Commissioner Mario Monti. Mr.

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<sup>9</sup> France, Germany, Italy, Spain, and the United Kingdom.

Monti was the head of the competition directorate between September 16, 1999 and November 22, 2004. In the US, we coded *Enforcement Regime* as one for enforcement decisions taken by the administration of Chairman Robert Pitofsky (April 1995 through May 2001). The third institutional variable was *World Market*. It equaled one for cases for which the most problematic relevant market was considered to be worldwide.

## **Appendix C – Robustness Analysis**

The models discussed in the paper are customized to the regulatory realities of the enforcement policies in the EU and US. To assess the robustness of the estimations, this appendix presents two additional sets of results. First, models are re-estimated after replacing the entry variable with a binary entry indicator. Second, the structural theory is standardized on one variable, the interaction of the market shares for the two merging parties. These specifications show the core results were robust.

The transformation of the entry index from a discrete variable to a binary variable appears easy; simply set the barrier index to one when-ever evidence on entry impediments is found. For the EU, this approach is not difficult to implement. For the US, this simple approach does not work, as all easy entry matters involve closed investigations. Hence, this model could only be estimated using the subset of cases for which there was at least one entry concern raised in the staff memos. Two recoding structures were used on the entry variable to allow all the data in to be retained in the robustness analyses. The first recoding scheme (with coefficients reported in Table C-1) defines the binary entry index as 0 when one staff office (either attorneys or economists) advances a relatively weak entry argument (*i.e.*, claiming barriers based on only one of the conditions of timeliness, likelihood, or sufficiency) and the other staff reports easy entry. A second recoding scheme codes the binary index as 1 if BE and BC agree on the existence of entry impediments, and zero otherwise. Qualitatively, there was little difference in results for the different recoding methods and the first recoding scheme that retained all the data in the analysis is used.

In Tables 4 and 5, the models are customized for the enforcement structures in the EU and US, respectively. While these models offer more accurate predictions, it is interesting to consider a single enforcement structure. The second robustness check standardizes the structural analysis on a single index. The natural logarithm of the product of the market shares of the merging parties is used in the estimations. This variable has special implications because it can be linked to either the market share of the merging firms or the change in the Herfindahl.<sup>1</sup> To allow enforcement differences in collusion and unilateral-effects cases, a constant for the use of a unilateral effects theory is introduced into both models.

The results are presented in Tables C-1 and C-2. Table C-1 replaces the entry index with an entry dummy and Table C-2 standardizes the use of structural variables by focusing on the logarithm of the interaction of Share1 and Share2. Two models are estimated for each of the two data sets. The first and third columns of each table re-estimate Model 3 in the text (identified as CEU3 and CUS3) and the second and fourth columns address Model 4 (CEU4 and CUS4).

The EU estimations in Table C-1 are comparable to the results obtained using the original models presented in Table 4. All the coefficients that were significant in the initial estimations presented in Table 4 are still significant and have the same sign. For the *National Player* and *Enforcement Regime* variables, the level of significance drops slightly and for the *Unilateral Effects* variable, the level of significance increases. Not surprisingly,

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<sup>1</sup> The log of the product of the two market shares decomposes into the sum of the logs of each market share considered separately (but with their coefficients restricted to be the same). For the dominance cases, this restriction was not rejected, so only one coefficient was reported. Given the product of the shares of the merging parties is equal to one half the change in the Herfindahl index, the log of that number is a simple nonlinear transformation of a traditional index for the change in the ease of collusion. An indicator variable for unilateral effects theory allows the enforcement probability to differ between the theories.



the coefficient on the indicator entry effect is slightly smaller than when using the entry index.

The US results are also relatively comparable to those in Table 5. All variables retain their statistical significance (although sometimes at lower levels) in the new specification.<sup>2</sup> The variables also exhibited coefficients that are remarkably similar to those in Table 5, but, again, the overall effect can only be determined through calculations.<sup>3</sup>

Table C-2 repeats the core analysis, but standardizes the structural analysis on the logarithm of the interaction of Share1 and Share2. The EU estimations show no major changes compared to the estimates presented in Table 4. The variables maintain their statistical significance and change very little in magnitude. The same basic results are observed for the US. The key explanatory variables maintain their statistical significance and change only marginally in value. However, the parameter for the *Enforcement Regime* variable loses its statistical significance. This result is not surprising, given the lack of theoretical support for the initial result. Overall the qualitative features of the parameters are robust to the changes in specification.

It is interesting to test the robustness of the hypothetical enforcement predictions (as defined in section VII) to the changes in model specification. In the top part of Table C-3, the hypothetical prediction rates based on estimation results presented in Tables C-1 and C-2 are given using both the EU and US data as weights. In the lower part, the results from the Oaxaca decomposition are presented. When weighting with EU data, the results from the decomposition basically coincide with the results found earlier in the paper. For the

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<sup>2</sup> An unreported regression deleted the easy entry observations and re-estimated the model without the entry index. No material changes were observed (although buyer sophistication and the Clinton-era variable became marginally significant).

<sup>3</sup> The comparison implies relative effects would be comparable, since the impact of a movement from zero to one evidence characteristics would be offset by a vertical efficiency finding.

models in Table C-1, the US is approximately 5 percentage points less aggressive when enforcing the EU cases, while the models in Table C-2 show an enforcement rate that is over 20 percentage points lower than the actual EU enforcement rate (65.6 percent).

When using the US data as weights, the results show that the US is a little more aggressive than the EU in the Table C-1 models, but there is no real difference for the Table C-2 models, as long as US firms are not recoded as EU players. If the simulations integrate a strong national player effect, we find the US is much more aggressive than the EU. The US enforcement regime is computed to be 15-20 percentage points higher than the comparable EU value. This result also matches those noted in the text.

Table C-1 – Econometric Results for Enforcement Probability, Entry Dummy

	(EU3)	(EU4)	(US3)	(US4)
Entry Dummy	0.825*** (2.88)	0.940*** (2.99)	2.085*** (4.70)	2.438*** (4.29)
Post-Merger MS	0.359 (0.89)	0.359 (0.90)	-	-
Share2	0.459*** (2.67)	0.457** (2.48)	-	-
HHI * Collusion			2.394*** (4.68)	2.977*** (4.27)
Rivals * Unilateral			-2.870*** (-4.20)	-3.139*** (-3.40)
Buyer Sophistication	-0.668 (-1.18)	-0.517 (-0.87)	-8881*** (-2.68)	-8035** (-2.32)
Vertical Issues	0.011 (0.04)	0.225 (0.75)	-.7685* (-1.81)	-1.052** (-1.96)
Evidence- Anticompetitive	0.566 (1.25)	0.465 (1.00)	1.540*** (3.67)	1.744*** (4.01)
National Player	-	-0.722* (-1.92)	-	-8363 (-1.64)
Enforcement Regime	-	0.733** (2.44)	-	-9076* (-1.80)
World Market	-	1.044** (2.28)	-	-01662 (-.04)
Unilateral Effects	0.920** (2.04)	0.957** (2.07)	23.3*** (5.42)	28.48*** (4.44)
Constant	-3.839*** (-2.63)	-4.191*** (-2.80)	-21.33*** (-4.91)	-25.28*** (-4.33)
Pseudo R-squared	0.23	0.33	.61	.65
Pseudo Log-likelihood	-58.41	-50.18	-41.74	-37.67

a. Dependent variable: Enforced.

b. Robust t-statistics in parentheses.

c. \*significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Table C-2 – Econometric Results for Enforcement Probability, Same Structure

	(EU 3)	(EU4)	(US3)	(US4)
Entry Index	0.904*** (3.10)	1.082*** (3.54)	2.085*** (5.45)	2.135*** (5.35)
Ln (Share1*Share2)	0.464*** (2.98)	0.428** (2.51)	.8331*** (3.60)	.8276*** (3.44)
Buyer Sophistication	-0.636 (-1.16)	-0.463 (-0.81)	-.8381** (-2.54)	-.7222** (-2.11)
Vertical Issues	-0.007 (-0.02)	0.229 (0.77)	-1.313*** (-3.26)	-1.431*** (-3.28)
Evidence Anticompetitive	0.503 (1.15)	0.374 (0.81)	1.546*** (3.92)	1.584*** (4.22)
National Player		-0.838** (-2.19)		-.5502 (-1.29)
Enforcement Regime		0.747** (2.52)		-.4294 (-1.33)
World Market		0.999** (2.13)		-0.2789 (-.55)
Unilateral Theory	0.724* (1.74)	0.778* (1.88)	.04642 (.16)	.1279 (.43)
Constant	-3.887*** (-4.01)	-4.003*** (-3.66)	-6.957*** (-4.78)	-6.326*** (-4.11)
Observations	112	112	166	166
pseudo R-squared	0.22	0.34	0.55	0.56
Log-likelihood	-58.53	-49.73	-48.67	-46.94

d. Dependent variable: Enforced.

e. Robust t-statistics in parentheses.

f. \*significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Table C-3 – Robustness Results for the Oaxaca Decomposition (dominance cases)

	Table C-1			Table C-2		
	Hypothetical rate (percent)					
	<u>Model 3</u>	<u>Model 4</u>	<u>Model 4A</u>	<u>Model 3</u>	<u>Model 4</u>	<u>Model 4A</u>
EU regime on US mergers:	76.6	75.1	59.4	81.0	80.6	64.2
US regime on EU mergers:	58.7	62.5	61.9	39.3	43.7	42.4
	Decomposition (percentage points)					
	<u>Model 3</u>	<u>Model 4</u>	<u>Model 4A</u>	<u>Model 3</u>	<u>Model 4</u>	<u>Model 4A</u>
Weight coefficients with US data						
Amount due to regime:	4.1	5.6	21.3	-0.3	0.1	16.4
Amount due to case mix:	11.0	9.5	-6.2	15.4	15.0	-1.3
Weight coefficients with EU data						
Amount due to regime:	-6.9	-3.1	-3.7	-26.3	-21.9	-23.2
Amount due to case mix:	22	18.2	18.9	41.4	37.0	38.3

a. The calculations presented in this table use 96 EU dominance observations and 88 related US observations.

b. As before, the actual enforcement rates for the dominance cases are 80.7 percent for the US and 65.6 percent for the EU, with the actual difference in enforcement rate being 15.1 percentage points.

## Appendix D – Generalization of the Oaxaca Decomposition to the Probit Model

This appendix extends the linear Oaxaca decomposition to the nonlinear probit model. For simplicity of notation, let  $Y$  represent the enforcement outcome ( $Y = 1$  implies enforce). Suppose that for a case presented before the EU, the probability of enforcement is  $P_E(Y = 1)$ , and that the analogous probability for a US matter is  $P_U(Y = 1)$ . Since  $Y \in \{0, 1\}$ ,  $P_E(Y = 1)$  and  $P_U(Y = 1)$  equal the expected value of  $Y$  in the EU and US, respectively (*i.e.*, the overall -- unconditional -- European and US enforcement rates, respectively). Define  $E_E = P_E(Y = 1)$  and  $E_U = P_U(Y = 1)$ . Using this notation, we can write the difference in US and European enforcement rates as:

$$(D1) \quad E_U - E_E.$$

In a similar manner to the linear Oaxaca decomposition, our goal is to break (D1) into the portion due to the enforcement regime (represented by the coefficients in our models) and the portion due to case mix.

To aid in the deriving the decomposition, we need to write  $E_U$  and  $E_E$  in terms of the distributions of the explanatory variables and the parameters of the probit models. To this end, suppose that each enforcement outcome is part of the ordered pair  $(Y, X)$ , where  $X$  is a vector of explanatory variables. Then,

$$(D2) \quad E_E = P_E(Y = 1) = \iint y f_E(x, y) dx dy ,$$

where  $f_E(x,y)$  is the joint density of  $X$  and  $Y$  in the EU. By definition of a conditional density function and expectation, we can write the RHS of (D2) as:

$$(D3) \quad \iint y f_E(y|x) f_E(x) dy dx \\ = \int E_E(Y|x) f_E(x) dx,$$

where  $f_E(x)$  is the density of the explanatory variables in Europe;  $f_E(y|x)$  and  $E_E(Y|x)$  are the conditional density and expectation of  $y$  on  $x$ , respectively, in the EU.

Similar algebra shows:

$$(D4) \quad E_U = \int E_U(Y|x) f_U(x) dx,$$

where  $f_U(x)$  and  $E_U(Y|x)$  are the density of the explanatory variables and the conditional expectation of  $Y$  on  $x$ , respectively in the US.

The elements of (D3) and (D4) provide the foundation for the decomposition. Obviously, (D3) and (D4) include information on the distribution of the explanatory variables, through  $f_U$  and  $f_E$ . Moreover, by definition, the European and American probit models are  $E_E(Y|x)$  and  $E_U(Y|x)$ , respectively. Thus, with (D3) and (D4) we are able to write the decomposition. Substitute (D3) and (D4) into (D1):

$$(D5) \quad E_U - E_E = \int E_U(Y|x) f_U(x) dx - \int E_E(Y|x) f_E(x) dx.$$

Add  $\pm E_U(Y|x)f_E(x)$  to (D5) to obtain the decomposition:

$$(D6) \quad E_U - E_E = \int [E_U(Y|x) - E_E(Y|x)] f_E(x) dx + \int E_U(Y|x) [f_U(x) - f_E(x)] dx .$$

The first term in (D6) gives the portion of the difference in enforcement rates due to the parameters of the probit models, *i.e.*, the difference due to the regimes. As in the linear Oaxaca decomposition, this difference can be weighed with either sample's distribution of the explanatory variables. Here, it is weighted by the European distribution of the explanatory variables. The second term in (D6) gives the difference due to the distributions of the explanatory variables, weighted by the US model.

There is of course an indexing problem, as we could just as well have added  $\pm E_E(Y|x)f_U(x)$  to obtain the decomposition:

$$(D7) \quad E_U - E_E = \int [E_U(Y|x) - E_E(Y|x)] f_U(x) dx + \int E_E(Y|x) [f_U(x) - f_E(x)] dx .$$

We report both (D6) and (D7), as is common in applications implementing the linear Oaxaca decomposition.

In practice, we do not know the actual distributions  $f_U$  and  $f_E$ . Moreover, we only have estimates of the probit models. Therefore, we estimate the components of (D6) and



(D7) by their sample analogs. Let  $\mathbf{E}$  represent the set of all observations  $(Y_i, X_i)$  in the EU, and let  $\mathbf{U}$  be the set of all observations  $(Y_i, X_i)$  in the US. We estimate

$$(D8) \quad \int E_U(Y|x)f_U(x)dx \text{ by } \left(\frac{1}{\#\mathbf{U}}\right) \sum_{i:(Y_i, X_i) \in \mathbf{U}} Y_i;$$

$$(D9) \quad \int E_E(Y|x)f_E(x)dx \text{ by } \left(\frac{1}{\#\mathbf{E}}\right) \sum_{i:(Y_i, X_i) \in \mathbf{E}} Y_i;$$

$$(D10) \quad \int E_E(Y|x)f_U(x)dx \text{ by } \left(\frac{1}{\#\mathbf{U}}\right) \sum_{i:(Y_i, X_i) \in \mathbf{U}} \hat{E}_E(Y|X_i);$$

$$(D11) \quad \int E_U(Y|x)f_E(x)dx \text{ by } \left(\frac{1}{\#\mathbf{E}}\right) \sum_{i:(Y_i, X_i) \in \mathbf{E}} \hat{E}_U(Y|X_i),$$

where  $\hat{E}_E(Y|X_i)$  is the estimated European probit model, and  $\hat{E}_U(Y|X_i)$  is the estimated US model, and  $\#\mathbf{E}$  and  $\#\mathbf{U}$  represent the number of European and US mergers, respectively ( $\#\mathbf{S}$  is common notation following set theory for the number of elements in set  $\mathbf{S}$ ).<sup>1</sup>

Intuitively, the estimates in (D8) and (D9) are the sample mean enforcement rates in the US and EU, respectively. The estimate in (D10) is the hypothetical enforcement rate of the EU, if the EU had the same case mix as the US, and the estimate in (D11) is the hypothetical rate of enforcement of the US on the EU cases. The hypothetical predictions are in Table 7 in the text.

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<sup>1</sup> The US uses variables not in the corresponding EU model, and *vice versa*. We handle these situations by constraining the omitted variables' coefficients to zero in each model.