

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/5157371>

An Empirical Analysis of Mexican Merger Policy

Article *in* Review of Industrial Organization · March 2008

DOI: 10.1007/s11151-008-9168-x · Source: RePEc

CITATIONS

13

READS

72

2 authors, including:



Rafael De Hoyos

World Bank

52 PUBLICATIONS 868 CITATIONS

SEE PROFILE

An Empirical Analysis of Mexican Merger Policy

*Marcos Avalos
Rafael E. De Hoyos*

The World Bank
Development Prospects Group
February 2008



Abstract

A newly created dataset including 239 decisions made by the Mexican Federal Competition Commission on horizontal mergers between 1997 and 2001 is used to estimate the different factors affecting the Commission's resolution. The paper approximates the decision making process using two different discrete choice models. The results indicate that, contrary to the Commission's objective, the presence of efficiency gains increases the

probability of a case being issued. The findings also show that factors different from the ones explicitly mentioned by the Commission have a significant effect on the Commission's final decision. In particular, the presence of a foreign company among the would-be merger firms significantly increases the likelihood of observing an allowed merger.

This paper—a product of the Development Prospects Group—is part of a larger effort in the department to evaluate competition policy in middle income countries. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at rdehoyos@worldbank.org.

The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

AN EMPIRICAL ANALYSIS OF MEXICAN MERGER POLICY*

Marcos Avalos[†] and Rafael E. De Hoyos[‡]

[†]Faculty of Economics and Business, Anáhuac University

[‡]Development Prospects Group, The World Bank

JEL Classification: L51, D43, C35

Keywords: Competition Commission, Mexican Merger Policy.

[†] Av. Lomas Anáhuac s/n, Fracc. Lomas Anáhuac Huixquilucan, México, C.P. 52786.. Tel. 52(55) 56 27 02
10 Ext. 8627 Fax 8120 Correspondance Author: mbracho@anahuac.mx

[‡] Development Prospects Group, WB, 1818 H Street, NW, Washington, DC 20433Tel: 202-458 4823 Fax:
202-522 2578 rdehoyos@worldbank.org

I. Introduction

The year 2004 marked the 10th anniversary of the Competition Commission (FCC), Mexico's institution responsible for designing, implementing and enforcing competition law. Between April 1997 and December 2001, more than 300 merger cases were evaluated by the Commission with more than 50 of them being issued or sanctioned. Despite of the important role played by the FCC, to the best of our knowledge, no study had formally analysed how the decisions of the FCC are affected by different economic factors. This study represents an effort to close this significant gap in the literature contributing to our understanding of the accuracy of competition policy implementation. In order to estimate the relationship between the FCC's decisions and observable market structure variables, a new database was constructed by the authors. Each of the 239 reports available representing the same number of merger decisions occurring between 1997 and 2001 were read and their information mapped into qualitative variables in the dataset. Using this new dataset, the paper presents the results from two different discrete choice models of horizontal merger cases decided by the FCC under Mexico's Federal Economic Competition Law (FECL). The main purpose of this study is to identify the relative importance of different economic factors relevant to the FCC's decision. Our approach uses a simple statistical analysis to assess the relationship between the Commission's outcomes and the factors which, according to the FECL, should have determined those resolutions.

The merger provisions, discussed in some detail in Section II, are governed by the FECL and its Code of Regulations. The FECL states explicitly that structural factors, such as the market share, cannot be the sole determinants of outcomes. In addition, it provides a list of factors that must also be considered. Thus, the mergers provisions allow the FCC to consider several factors while deciding upon the outcome of a merger case.

What makes the FCC prohibit a merger? How important is the information contained in the mergers provision for the final decision taken by the FCC? Has the FCC been more likely to judge against a merger based on a decision that assigns more weight to a particular economic factor? These are all relevant questions. In the present paper, we address these

issues with the help of econometric analysis based on 239 Mexican merger cases occurring between 1997 and 2001.

Several studies, based on country-specific information, have endeavored to identify the determinants of the antitrust enforcement authorities' decisions. In the United States for instance a number of papers, including those by Posner (1979), Katsmann (1980) and Coate *et al.* (1990, 1992), are concerned with the case selection process. With the use of a probit model, Coate *et al.* (1990, 1992) found evidence that political variables, such as pressure from the Congress, have an influence on merger decisions. The same study shows that the authority did not consider efficiency gains while evaluating a would-be merger. The authors also found that lawyers at the Federal Trade Commission (FTC) had more influence than the authority's economists. More recently, Coate and Kleit (2005) modeled the merger review process in which the FTC interacts with the acquiring firm to determine the outcome of antitrust regulation. They analyzed what sort of factors influence in the firm's decision to litigate, fold or settle. Their main finding was that the efficiency variable played a significant role in the firm's decision-making process. Potential efficiencies are positively linked with the probability of a firm engaging into a litigation process if the FTC challenges the merger. Moreover, the authors found that firms deterred from fighting the FTC by the potential of negative impacts on their reputations. In the United Kingdom, Weir (1992, 1993) uses a probit model to evaluate the relationship between the resolutions reached by the Monopolies and Mergers Commission (MMC) and the criterion set out in the statutory "public interest" test, such as prices and quality, cost reduction, new entry and foreign trade among the others. Weir shows that very few of the issues which are part of the "public interest" appear to influence the Commission's decision. For example, the author found that mergers are more likely to be allowed if they do not affect either competition or prices. However, potential benefits, such as greater employment or increased exports, do not consistently help the would-be merged firm. Davies *et al.* (1999) applied the same binary approach to 73 monopoly cases handled by the MMC finding that the Commission's decision is greatly explained by market shares of the participating firms. Khemani and Shapiro (1993) found that the Canadian antitrust authority has applied the merger guidelines in a consistent manner. Bergman *et al.* (2005) used a logit model to

analyze merger decisions in the European Commission finding results similar to those reported by Khemani and Shapiro (1993). Kouliavtsev (2005) studies the effectiveness of anti-merger relief in the United States as an outcome of bargaining game between the antitrust agency and parties to the merger. Kouliavtsev finds that the structural relief (divestiture) depends on the extent of merger-specific efficiencies, the anticompetitive potential of the merger, and the hostage effect facing the merging firms, as well as the degree of media coverage of the case, and partisan composition of the Congress. There is a recent literature lead by Coate (2005a, 2005b) that finds that in addition to the standard structural variables, the FTC appears to make extensive use of factual information on “hot documents”, “event studies”, and “validate customer complaints” while taking decisions. Finally, to the best of our knowledge, no formal quantitative study had focused on the decision process undertaken by the Mexican FCC.

The rest of the paper is structured as follows. Section II provides a brief definition of the merger guidelines determining the FCC decision process; this section also explains how the dataset was constructed and shows the mean values of the variables used in the econometric analysis. Section III discusses the research design and explains the advantages of the two discrete choice models used. Section IV presents the results of the ordered and multinomial logit models. Finally section V offers some general conclusions.

II. Mexican Competition Policy

2.1 Merger Guidelines¹

The FCC enforces the FECL, including those laws applicable to mergers. The FCC decision process concerning the resolutions on possible mergers consists of a two stage procedure. In the first stage, an economic and juridical report is prepared by the Commission’s staff members. At the end of each report, the staff members produce an informal recommendation stating whether the merger should be rejected, conditioned or passed without any commitments. The report is based in turn on data submitted to the

¹ For further details, see the FECL and the Code of Regulations of the same law.

Commission by would-be merging firms, as required by the FECL, and on information developed independently by FCC staff lawyers and economists. In the second stage, the Commission takes formal action through a majority vote of the sitting commissioners (ordinarily five). The commissioners carefully review the report and vote whether or not to challenge a merger. Article 39 of the FECL allows the potential merger entity to appeal the Commission's decision through an institutional device called "reconsideration resource." However, this device is an institutional one and only the FCC can review and ratify, modify or revoke the original resolution.² Moreover, the merger firms can make use of a legal process called "*juicio de amparo*" (judicial review).³

The primary objective of FECL is to protect and/or enhance economic efficiency.⁴ This topic is evident in the merger provisions of the FECL. The criterion specified in the statute states that "The Commission shall challenge and sanction those concentrations which objective or effect is to diminish, damage or deter competition and free access to equal, similar or substantially related goods and services." The approach adopted is similar to that employed in the United States under the Merger Guidelines published by the Antitrust Division, Department of Justice [1984]. Essentially, to diminish damage or deter competition is considered to occur when a merger enables the firm(s) to, unilaterally or interdependently with others, implement market power. In other words, competition is hampered when a firm or group of firms can unilaterally set prices or substantially restrict supply in the relevant market. Focus is normally placed on the ability of the firms to influence price or intends to unjustifiably displace competitors; however, other aspects of competition policy, such as efficiency gains, variety, service, and advertising, are also considered where applicable.

² In practice, most of the "reconsideration resources" have been ratified.

³ The FCC reports that nearly one in eight of its non-approving decisions ends up being blocked by an *amparo*. It is important to mention that unlike in the US, the District Local Court can challenge the legality or constitutionality of the Commission's decision, but not the essence of the resolution.

⁴ For a detailed discussion of the FECL, see Levy (2000).

Concentration analysis, based on the Herfindahl-Hirschman (*HHI*) and Dominance (*DI*) indexes are probably the guideline's best known aspects. The guideline's concentration criterion establishes the following index classifications:⁵

1. Where the post-merger *HHI* index increases less than 75 points or is less than 2,000 points, a merger has a low probability of being blocked. Thus, a *HHI* index less than 2,000 is a safe harbor; mergers falling below that level will rarely be blocked.

2. If the post-merger *DI* reduces or is less than 2,500 points, a merger has a low probability of being blocked. Thus, a *DI* index less than 2,500 is a safe harbor.

The Law states that any factor that the Commission deems appropriate, given the nature of the relevant market, e.g. sales indicators, number of customers or productive capacity and so on, will be used as the input while constructing the concentration indexes. Furthermore, the FECL sets out a list of factors that, in addition to concentration indices, should be used to determine whether competition has been lessened substantially. Factors listed are:⁶

1. Actual or possible effective import competition;
2. Availability of substitutes;
3. Any barriers to entry including financial costs, amount of the required investment, and regulatory control over entry, and any effect of the merger on such barriers to entry;
4. Share equity of the firm(s) or agents involved in the merger on other firms participating directly or indirectly in the relevant market or in related markets;

⁵ See Official Journal of the Federation (OJF), July 24th 1998. The *HHI* index, which is equal to the sum of the squares of the market shares, is well known in the literature and extensively used in many antitrust authorities around the world as the first screen for merger approval. For example, the *Horizontal Merger Guidelines* of the Department of Justice (DOJ) and the Federal Trade Commission (FTC) establish a presumption of illegality when a post-merger *HHI* exceeds 1,800 and the merger-induced change in the index exceeds 100 points. Expressing the shares in percentage terms, the maximum value the *HHI* can attain is 10,000 in a situation where all supply is concentrated in a single firm, and the minimum value is 10,000/N when all firms have equal market shares. In Mexican merger control the FCC also relies on the so-called Dominant Index (*DI*) as a first screening device. For a description of *DI* index, see Appendix 1.

⁶ These factors are not mutually exclusive nor arranged in order of importance.

5. Priori participation of the merged entity in the relevant market or related markets;
and

6. Evaluation of possible efficiency gains by the merged firm. Such efficiency gains including economies of scale and scope, significant reduction of administrative costs, transfer of production technology and lowering of production or costs derived from the expansion of an infrastructure or distribution network.

Thus, the merger provisions not only specify that concentration cannot be the sole criteria for determining outcomes, but also provide a list of additional factors to be considered. However, the FECL and Merger Guidelines provide no guidance as to the relative importance of each factor, nor any instructions as to how they ought to be weighted relative to market concentration or market share.

2.2 Data Construction

We constructed a dataset from different sources including: the official public resolutions (merger decisions) produced by the FCC and published in the *Gaceta de Competencia Económica*, Annual Reports and indirect sources, such as specialized magazines.⁷ The FCC considered a total of 350 cases covering the period from April 1997 to December 2001. Nevertheless, our dataset includes only those cases having complete information; therefore the final sample contains a total of 239 cases which represent the great majority of horizontal mergers examined by the FCC during this period. Each case file was carefully read by the authors in order to extract and classify the necessary information.⁸

⁷ An alternative to get accurate information is through the internal files that include the economic report made by the Commission's staff members. Although we made a formal approach with the Commission's officials, we were not able to obtain access to such information, as it is classified by law as confidential. Actually, this becomes a restriction to build information on mergers before 1997; the first official publication of merger resolutions was not before April 1997. Coate *et. al.* (1990) were the only scholars able to build data from the internal files of the FTC by agreeing not to publish the data.

⁸ The complete dataset used in this study is available at:
<http://www.anahuac.mx/gof/index.php?IDPagina=Avalos%20Brachocv>

A large number of qualitative variables were recorded in an effort to capture the factors that determined the Commission's decision. The variables were recorded in such a way to solely reflect the judgments of the Commission's officers. After the evaluation a merger could be allowed, conditioned or blocked.⁹ The distribution of cases according to the FCC decisions is shown in Table I. The great majority of the cases, almost 80 per cent, were allowed while quite a few of them (less than 5 per cent) were blocked.

Table I: Variable Definition and Mean Value by Resolution

Variable	Allowed	Conditioned	Blocked
Number of Cases	188	40	10
Percentage	79 %	16.7 %	4.1 %
Concentration Variables (H)			
<i>HHI</i> : Herfindahl index	1,534	2,190	2,811
<i>DI</i> : Dominance index	1,948	2,978	4,209
Variables explicitly stated in the merger provisions (Z)			
<i>HIST</i> : prior participation in the relevant market	0.048	0.075	0.200
<i>EQ</i> : equity share	0.005	0.075	0.400
<i>EF</i> : efficiencies present	0.016	0.100	0.100
<i>IMP</i> : import competition present	0.238	0.200	0.100
<i>EB</i> : entry barriers	0.174	0.400	1.000
Variables not present in the merger provisions (X)			
<i>MKT</i> : combined market share < 25%	0.460	0.225	0.100
<i>FRG</i> : foreign firm present	0.873	0.700	0.500

* All set of variables (*H,Z,X*) are defined over the *relevant market* which may be local, regional, or national.

⁹The FCC can impose three kinds of *conditions* on a merger: preventive, contractual and structural. A preventive condition could be the continuous monitoring of the dominant firm in the relevant market for a specific period of time. The contractual condition practically leaves market structure unchanged; it only affects ancillary agreements associated with the merger. Initially, the structural condition implied the banning (partially or totally) of the proposed merger. With the reform of the Competition Law in 2006, the structural condition takes the form of requiring the dismantling of some of the joint activities of the would-be mergers as a pre-condition for approving the merger.

Table I shows mean values by resolution for three groups of variables:¹⁰ concentration variables containing the Herfindahl (*HHI*) and Dominance (*DI*) indices; variables explicitly stated by the FECL as being relevant to the ultimate decision (as explained in the previous section); variables that are not present in the merger provision but were nevertheless mentioned in the FCC documents and hence might be relevant in the decision process. It is important to notice that the mean value of all three groups of variables differ across the three outcomes, suggesting that a dichotomous decision process—allow versus issue (condition or challenge)—might be misleading.

As it is shown in the top part of Table I, not surprisingly, conditioned and blocked mergers took place within markets that exhibited higher degree of concentration as measured with the *HHI* and *DI*. The average *HHI* was around 600 points higher between allowed and conditioned cases and between the latter and blocked. The second and third group of variables shown in Table I are binary ones. These variables were created case by case, where a value of one was recorded when the FCC's report indicated that the factor was relevant in the decision process. *HIST*, *EQ*, *EF*, *IMP*, and *EB* are all factors explicitly listed in the Law and Merger Guidelines. *HIST* indicates if one of the firms involved in the merger has been operating previously in the relevant market. *EQ* is a dummy variable taking the value of 1 when one of the merging firms has a patrimonial relationship (or *equity share*) with a third firm within the relevant or related market(s), and zero otherwise.¹¹ *EF* indicates if efficiency gains are present as stated by the would-be merging firms. The FECL and the Merger Guidelines established the evaluation of efficiency gains

¹⁰ Some economic variables either mentioned by the economic theory or that are used by antitrust authorities were excluded from the analysis. The reason for doing this is because they are not present in the FECL and the Code of Regulations or because some factors were simply impossible to code. For instance, the number of significant rivals is a relevant factor in the mergers evaluation done by the Federal Trade Commission in USA (see Coate, 2005b). Nevertheless, in the Mexican case, this factor doesn't seem to be a relevant one, appearing in only few file cases. This lack of information impedes us to form a variable with the number of significant rivals.

¹¹ The rationale behind the inclusion of *EQ* as a determinant of the FCC's resolution is rooted in the Mexican antitrust law. The law is concerned with possible dominance practices by one agent that has a significant patrimonial presence in two (or more) markets that are vertically integrated.

as a factor that may save a merger from being blocked.¹² Merger-specific efficiency gains are inferred from the information made available to the Commission.¹³ *IMP* reflects the Commission's perception on the relevance of import competition. *EB* denotes if the Commission finds high entry barriers in the relevant market. No quantitative measures of these entry determinants are provided, leaving one with the Commission's view if entry barriers are present or not. As we would have expected, the value of *HIST*, *EQ* and *EB* increases as we move from left to right in Table I, indicating that there is a higher probability of being issued (either conditioned or blocked) as the value of these market concentration indicators increase.

The last group of variables *MKT* and *FRG* are the "other factors" that were regularly mentioned in the documents, but are not explicitly established in the merger provisions. *FRG* indicates if a foreign firm is involved in the merger. *MKT* is equal to one when the FCC mentioned that the post-merger combined market share of the participating firms is less than or equal to 25 per cent. We use 25 per cent as the critical level, since this is the level below which dominance is presumed not to exist, while 30% is the level below which dominance is presumed not to exist (Bergman *et al.*, 2005, p 726-727).¹⁴ While *MKT* is an indicator variable capturing market structure, *FRG* has no *a-priori* effect upon the FCC's decision. However, simple descriptive statistics show that when a foreign firm was involved, most of the mergers were allowed.

¹² According to the law, the efficiency gains must be accredited by the firms involved in the would-be merger.

¹³ While it would be preferable to have a direct estimate of the value of the cost savings, this information is not available. Instead, we define this dummy variable that takes a value of one when the efficiency argument was mentioned on the FCC's resolutions.

¹⁴ Notice that *MKT* and *HHI*, although related, are conceptually different. While *HHI* captures the concentration of the relevant market as a whole, *MKT* picks up the relative importance of the firms involved in the merger. For some authors, the 25 percent share cut-off is too low. For instance, the US Merger Guidelines establish that the dominant firm cannot be presumed when the combined share of the merging parties is less than 35 percent (see US Merger Guidelines Section 2.22).

The variables mentioned above are evaluated in quantitative terms using discrete choice econometric models. After considering the available evidence, the decision making process goes as follows:

- i. The merger could be approved as initially planned by the involving firms, we called these cases *allowed*;
- ii. In some specific circumstances the merger could be *monitored* for a period of time or *restructured* by the FCC in order to alleviate concerns regarding substantial lessening of competition, we called these cases *conditioned*;¹⁵ and
- iii. The merger, in whole or in part, could be *blocked*.

III. Empirical Strategy

Before outlining our empirical strategy, it is important to mention that the paper does not aim to develop a structural model describing the FCC's decision process. Our focus lies on finding the statistical relationship between those factors that the FCC claims to be taking into account while evaluating a would-be merger and to Commission's final decision.

Let us define an unobservable continuous latent variable V_j , which determines the probability of falling into each of three possible outcomes: allowed, conditioned or blocked; define H as an index capturing market concentration; let \mathbf{Z} be a matrix whose columns contain the variables explicitly stated in the merger provisions; and \mathbf{X} a matrix formed of variables not present in the merger provision, but that could potentially influence the Commission's final decision. We model the probability of observing outcome "s",

¹⁵ Although the Code of Regulations and the Internal Manual Criteria process of the FCC establishes that it is possible that in some specific circumstances the merger could be *monitored* for a period of time (second point above), so far the FCC has implemented only once this criterion. We therefore merged together the possible *monitored* resolutions with the *restructured* ones, into a single outcome which we called conditioned.

$Pr(j=s)$, as a function of market concentration (H), the variables explicitly stated in the merger provisions (Z), and those ones not stated, but could influence the decision process (X). Assuming that the latent variable is a linear function of elements H , Z , and X , V_j can be modeled in the following way:

$$V_j = \alpha_j + \delta_j H + \gamma_j Z + \beta_j X + \eta_j \quad (1)$$

Where η_j is a random component and α_j , δ_j , γ_j , and β_j are constant parameters. The probability of observing outcome “ s ” is a function of the deterministic part of (1), $Pr(j = s) = F(V_s^*)$ where function $F(V^*)$ is defined by the cumulative distribution function of η_j . Therefore, the model used will depend on the assumption made about the distribution of the random component, η_j . For simplicity, in our two models, we assume that η_j are i.i.d. with extreme value distribution, i.e. they follow a logistic distribution function.

To allow for more flexibility while analyzing the data, we test two different model specifications. In the first one, we assume that a set of constant slopes across outcomes determines the probability of falling into any of the three categories; controlling for observables, the differences across outcomes are captured by two *cut-off* points or intercepts. Therefore, we estimate an ordered logit. In the second specification, we allow for full parameter heterogeneity across outcomes, where intercepts and slopes in specification (1) change between categories; therefore, we estimate a multinomial logit.

3.1 Constrained Model: Ordered Logit

Suppose that the parameters defining (1) do not differ across outcomes and that, controlling for observables, the differences in probabilities for each outcome are captured by a shift in an *arbitrary* constant, c . Therefore, the probabilities of observing each of the three outcomes will be given by the following equations:

$$\begin{aligned}
\Pr(\textit{allowed}) &= F(V^*) \\
\Pr(\textit{conditioned}) &= F(V^* + c) - F(V^*) \\
\Pr(\textit{challenged}) &= 1 - F(V^* + c)
\end{aligned} \tag{2}$$

Given the assumption that the distribution of η_j follows a logistic form, model (2) is the ordered logit. Constant c is a parameter to be estimated within the model and its significance can be interpreted as indicative of a correct model specification (Maddala, 1983).

3.2 Unconstrained Model: Multinomial Logit

A less restrictive specification will allow the parameters in (1) to differ across outcomes. In this case the selection criteria will not be constraint to follow an *ordered* structure. Therefore, the FCC's decision will be characterized by the following expression:

$$Y = s \Leftrightarrow V_s > \max_{j \neq s} (V_j) \quad j=1,2,3 \tag{3}$$

Equation (3) implies that those parameters defining V_j are the outcome of a probability-maximizing process. The probability, $\Pr(Y=s)$, will depend on the assumption we make about the error term (η_j). Assuming the residuals, η_j , are independently and identically distributed with type I extreme-value distribution give rise to the well-known multinomial logit model:

$$\Pr(Y = s) = \frac{\exp(\alpha_s + \delta_s H + \gamma_s Z + \beta_s X)}{\sum_j \exp(\alpha_j + \delta_j H + \gamma_j Z + \beta_j X)} \tag{4}$$

Notice that we are not assuming any structure on the underlying process governing the FCC's decision; we are simply modeling the probability of falling into any of the three outcomes.¹⁶

A sensible criticism of our empirical strategy could question the advantage of adopting two different models instead of only one or the superiority of our two preferred specifications over other discrete choice models. For instance, if the Commission's final decisions are indeed characterized by a *preferred*, ranked or ordered criterion, then the use of a multinomial logit (which ignores ordering of the outcome variable) could be misleading. Nevertheless, the use of both models (ordered and multinomial logit) to analyze the same problem is justified on the basis of the uncertainty about the ordered nature of the outcomes.¹⁷ Furthermore, it might also be the case that a simple binary model (allowed versus not allowed) could capture, in a better way, the relationship between explanatory variables and the Commission's decision. To explore this possibility, we estimated a logit where outcomes "conditioned" and "blocked" were merged together. However, the ordered logit showed a better fit than the logit model with significant *cut-off* points. Moreover, the Wald tests for parameter homogeneity across outcomes "conditioned" and "blocked" was rejected for two of the RHS variables included in our model supporting a multinomial model as opposed to a binary one. Finally, we explored the possibility of a nested structure where the FCC first decide on whether to allow or issue a merger and then, given that a case was issued, decided to condition or challenge it. This model showed poor results with *inclusive values* being not significant. Therefore, we believe that the ordered and multinomial logit models were the best ones to describe the data, both in statistical and intuitive sense.

¹⁶ The ordered and multinomial logit models can also be interpreted as the outcome of a utility-maximizing process, where the selected outcome maximizes the indirect utility of a rational agent. See McFadden (1974, 1984).

¹⁷ As stated by Long (1998): "If there is any question about the ordinality of the dependent variable, the potential loss of efficiency in using models for nominal outcomes is outweighed by avoiding potential bias."

IV. Results

Two different specifications were estimated for each of the models. In the first one, a version of equation (1) containing only H and Z determined the FCC's decision and in a second one, the full set of independent variables (H, Z, X) was used. The purpose of having two specifications is to uncover the possible influence of X upon the relationship between $Pr(j=s)$ and (H, Z) . In other words, if the impact of a variable explicitly stated by the Commission (γ_j in equation 1) changes once we control for factors not explicitly stated by the Commission (X), then we can conclude that not taking into account X will lead to an incorrect (biased) estimation of the influence of (H, Z) upon the Commission's decision. In all regressions, the log of HHI is used as the concentration indicator variable however none of our results change if DDI had been used.¹⁸ All our results are based on heteroskedastic-robust standard errors.

4.1 Ordered Logit Results

Estimations of model (2) are presented in Table II. The first column shows the results of the model excluding matrix X . The cut-off points for both thresholds are positive and significant, suggesting the presence of a dependent variable with an ordinal structure. As we expected *a-priori*, HHI , EQ , and EB are positively related with a higher probability of being issued. When the merger occurs in a highly concentrated market, or if it shows market entry barriers, or if one of the participants holds a large proportion of the equity shares, the case has a higher probability of being issued (either conditioned or blocked). The presence of import competition, IMP , is only marginally significant and with the expected negative sign, i.e. mergers occurring in import-competing markets face a lower probability of being issued. Contrary to what the Commission explicitly states, the presence

¹⁸ The reason for entering HHI in log form is to account for potential non-linearities between the FCC's decision on a merger and the level of market concentration. Including HHI in levels rather than in logs does not change the results presented in Tables II and III, although the models showed a better fit when HHI was entered in logs.

of efficiency gains (*EF*) is not significant at conventional levels, having no apparent influence on the Commission’s decision.¹⁹

The value of the coefficients derived from the model cannot be interpreted directly; they are simply telling us the effect of the independent variables on the index determining the latent variable, *V*. Since we are interested in the marginal impact upon the probability of observing each outcome, we have to carry out the following transformations:²⁰

$$\begin{aligned}\frac{\partial \Pr(\textit{allowed} | x)}{\partial x_j} &= -\phi(x' \hat{\beta}) \hat{\beta}_j \\ \frac{\partial \Pr(\textit{conditioned} | x)}{\partial x_j} &= [\phi(-x' \hat{\beta}) - \phi(c - x' \hat{\beta})] \hat{\beta}_j \\ \frac{\partial \Pr(\textit{challenged} | x)}{\partial x_j} &= \phi(c - x' \hat{\beta}) \hat{\beta}_j\end{aligned}\tag{5}$$

where *x* is a matrix of independent variables in (2) and ϕ is the logistic p.d.f. The marginal effects for each outcome are shown in the bottom part of Table II. For a continuous independent variable, say x_1 , its marginal effect can be interpreted as the change in the probability of observing an outcome given an infinitesimal change around the mean of x_1 while setting all other independent variables at their mean value. For a discrete independent variable, say x_2 , the “marginal” impact is the change in the probability given a change in x_2

¹⁹ Similar results were obtained by Coate and McChesney (1992), and Weir (1992, 1993).

²⁰ As a matter of fact, contrary to the sign of the estimated coefficient, the marginal effect of a particular coefficient will differ across the ordered logit outcomes. From expression (5) we see that the sign of a particular coefficient will oppose the probability of it being allowed. By the same token, the sign of the estimated coefficient and the probability of being blocked will be the same. However, nothing can be said *a priori* about the marginal effect of x_j upon the probability of being conditioned. Therefore, to interpret the effects of the coefficients of an ordered logit on the three potential outcomes, it is necessary to compute the marginal effects (Greene (2003), pg. 738.)

from 0 to 1 keeping all other RHS variables at their mean.²¹ In our case, all marginal effects but the HHI are the outcome of discrete changes in the independent variables.²²

For the three significant variables *HHI*, *EQ* and *EB*, the marginal effect showed high values for outcomes “allowed” and “conditioned.” Controlling for everything else, a percentage increase in the *HHI* reduces in more than 0.14 percentage points the probability of a merger being allowed and at the same time, increases the probability of it being conditioned in more than 0.12 percentage points, *ceteris paribus*. On the other hand, for a case to be blocked, the commission will need to deem more important the presence of equity share holders—of other firms within the relevant market (*EQ*)—where the would-be merger is taking place. Everything else being equal, the presence of this effect in a merger case reduces its probability of being allowed by more than 54 percentage points.

Table II: Constrained Model: Order Logit

	$V = V(H, Z)$	$V = V(H, Z, X)$
ln(HHI)	1.03*** [3.52]	1.20*** [2.95]
HIST	0.54 [0.79]	0.85 [1.23]
EQ	2.54*** [2.73]	2.24** [2.08]
EF	0.52 [0.86]	0.76 [1.27]
IMP	-1.07* [1.80]	-1.11** [2.08]
EB	1.31*** [3.41]	1.20*** [3.22]
MKT		-0.11 [0.17]
FRG		-1.48***

²¹ In the presence of several binary RHS variables, it is possible to estimate the marginal effects setting all other RHS dummy variables at their most likely binary value. However, it is not clear that this method is preferred over the conventional one; the expected value of a binary variable is still its simple mean and this can also be interpreted as a probability.

²² Notice that the significance of the marginal effects though associated with is not necessarily equal to the significance of the estimated coefficient (β). In our case, all those variables that showed a significant coefficient had also a significant marginal effect; therefore *t*-statistics for marginal effects are excluded from Table II.

		Marginal Effects					
	Allowed	Conditioned	Blocked	Allowed	Conditioned	Blocked	
Cut-Off							
C1		9.25***			9.28***		
		[4.29]			[3.02]		
C2		11.68***			11.85***		
		[5.41]			[3.85]		
ln(HHI)	-0.142	0.125	0.017	-0.155	0.139	0.016	
HIST	-0.087	0.075	0.012	-0.141	0.124	0.017	
EQ	-0.545	0.390	0.154	-0.470	0.375	0.095	
EF	-0.085	0.073	0.011	-0.125	0.110	0.015	
IMP	0.122	-0.108	-0.014	0.117	-0.106	-0.012	
EB	-0.223	0.190	0.033	-0.192	0.169	0.023	
MKT				0.014	-0.013	-0.001	
FRG				0.256	-0.222	-0.034	
Observations		239			239		
Pseudo R2		0.20			0.24		

Notes: (1) Robust z-statistics in brackets; *, ** and *** represent statistical significance at 90, 95 and 99 percent level of significance, respectively. (2) Marginal effects of binary variables measure the effect of a change from 0 to 1.

In the upper right part of Table II we present the results of the model with all three elements of equation (1), i.e. H , Z and X . The two variables included in X (MKT and FRG) affect the FCC's decision in a significant way; moreover their high explanatory power is shown by the increase in 4 percentage points in the pseudo- R^2 . Once we control for elements in X , variable EQ loses significance, indicating a possible correlation between this variable and elements included in matrix X .²³ The results show that when the firms involved in the merger concentrate a low market share (less than 25 per cent), their case is more likely to be allowed than if they concentrate a high share of the market. More importantly, the marginal effects show that, contrary to what is explicitly stated in the mergers provisions, one of the strongest determinant affecting the Commission's decision is the presence of a foreign firm in the merger. Everything else being equal, foreign firms participating in a Mexican merger have a probability 25.6 percentage points lower than mergers involving only Mexican firms of being issued (either conditioned or blocked).

²³ Although some regressors show some degree of correlation, the Variance Inflation Factors (VIF) test for multicollinearity didn't show a serious problem.

4.2 Multinomial Logit Results

As it was mentioned before, model (2) is restricting the parameters to be the same across outcomes and it is assuming that the dependent variable follows an ordinal structure. This section shows the results from model (4) which relaxes these two constraints. The results of the multinomial logit model are presented in Table III.²⁴

Outcome “allowed” is taken as the base category; therefore, the coefficients in the upper part of Table III are interpreted as the effect on the likelihood of observing a particular outcome compared to observing an “allowed” case. Let us first concentrate in the results of a model specification with only variables explicitly mentioned in the mergers provisions (H, Z), included as regressors (left part of Table III).

The qualitative effect of HHI does not change with the new specification; mergers occurring within more concentrated markets are more likely to be issued. However, the multinomial logit specification shows that the effect of HHI varies substantially across outcomes.²⁵ Notice that the marginal effects of HHI across outcomes in this unconstrained model are practically corroborating our previous findings, i.e. the probability of being conditioned rises substantially when a merger is taking place in a *concentrated* market. Table III indicates that the significance of variables EQ , IMP and EB shown by the ordered model was indeed coming from the differences between the probabilities of a case being allowed versus being blocked.²⁶ By allowing the parameters to differ across the two outcomes, we can see that these three variables do not have a significant effect on the probability of observing a “conditioned” outcome. Quite the contrary can be said about the

²⁴ The two tests undertaken to evaluate the IIA assumption showed opposing results with the Hausman test supporting the IIA and the Small-Hsiao strongly rejecting it.

²⁵ This type of insights can only be obtained when we allow for full parameter heterogeneity; having at least one coefficient that differs across outcomes justifies our multinomial specification.

²⁶ We dropped variable EB from the “blocked” equation due to a lack of variation of this variable within the blocked cases. As it is seen from Table I, all the blocked outcomes occurred in the presence of EB . One should interpret EB as being a highly significant predictor of a blocked outcome.

presence of efficiencies (*EF*). Unexpectedly, the presence of market efficiencies has a positive and significant impact on the probability of being conditioned relative to being allowed.

Let's turn now to the marginal effects of the multinomial logit. We applied the following transformation to the estimated coefficients:

$$\frac{\partial \Pr(Y = s | x)}{\partial x} = \Pr(Y = s) \left[\beta_j - \sum_{k=1}^3 \Pr(Y = k) \beta_k \right] \quad (6)$$

where $s, k = (\text{allowed}, \text{conditioned}, \text{blocked})$ and $\Pr(\cdot)$ is given by equation (4). The marginal effect results are presented in the bottom part of Table III. Concerning the estimation of model $V = V(H, Z)$, the most important result is the one on *EF*. As we mentioned above, in the ordered logit estimations efficiency gains, although stated as one of the most important determinants of the FCC's decision, was not significant (see the right column of Table II). However, by running a separate equation for each outcome, we are able to identify a significant and counter-intuitive positive coefficient of *EF* on the probability of observing a "conditioned" merger relative to observing an allowed one. Moreover, the marginal effect of *EF* is the largest among RHS for the conditioned outcomes,²⁷ the presence of efficiency gains in a would-be merger increases its probability of being conditioned (relative to being allowed) by more than 26 percentage points.

The right part of Table III shows the results of the multinomial logit including the elements in matrix \mathbf{X} as explanatory variables [model $V = V(H, Z, X)$]. As it was the case with the ordered model, the variables in \mathbf{X} entered significantly in the regression and increased the explanatory power of the model (the pseudo R^2 passed from 0.19 to 0.23), confirming the importance of variables in \mathbf{X} in the FCC's ultimate decision. The other important result is the effect of the presence of a foreign firm which remains significant having a negative effect on the probability of observing either "conditioned" or "blocked" outcomes. When a

²⁷ The marginal effect of *EQ* is larger, though its estimated coefficient is not significantly different from zero.

foreign firm is taking part in a merger, the probability of that case being issued is reduced by around 22.7 percentage points.

Surprisingly, the coefficient on *EF* hardly changed. Once the variables in *X* were included, *EF* turned out to be the single most important variable determining a conditioned outcome. This result shows that, contrary to the FCC's objective, when economic efficiencies are present—as it is understood from the staff memorandum, with the information given by the firms participating in the would-be merger—the commissioners are more likely to condition a merger than to allow it *ceteris paribus*. There are two ways in which the apparent anomaly behind the positive coefficient on *EF* can be explained.²⁸ First, a would-be merging entity that is aware of potential increases in market concentration as a result of the merger, may be inclined to make larger efficiency claims to try to counter-act its effect on concentration. Second, the authorities may account for the counteracting effect just explained, and hence be particularly skeptical about ambitious claims of efficiency gains. If either of these hypotheses (or both) is correct, the final outcome would be a positive correlation between efficiency gains and the probability of being conditioned. This result might reflect that the Mexican merger policy involves the delicate balancing of anticompetitive effects against possible efficiency gains. In assessing this trade-off, the antitrust authority often relies on very limited and imperfect information. Not only is the evaluation of market power inherently imprecise, but the merging parties typically have better information about potential efficiency gains than the regulator.²⁹ Of course, the merger review process is designed to extract as much information as possible from the parties, but it is reasonable to assume that some asymmetries remain.³⁰

²⁸ We thank an anonymous referee for valuable comments on the possible intuition behind this result.

²⁹ In practice, most mergers claim to achieve some kind of efficiency gains or “synergies,” i.e. some form of cost reduction or quality improvement. White (1987) and Fisher (1987) argue that efficiencies gains are typically easy to claim, but hard to prove. Fisher (1987) argues in favour of very high standards for proving actual efficiencies, based on several examples where efficiencies gains were claimed but they were not materialised.

³⁰ Efficiency gains from horizontal mergers are a relevant policy issue to date. For example, Roller and Verboven (1999) discuss this issue extensively and point out that there is a debate within U.S. and EU antitrust agencies whether to include a more precise treatment of efficiency defence in their merger

Our results suggest that the FCC decision is not entirely based on the mergers provisions. Moreover, when ever the merger provision was stating the presence of “other economic factors” (matrix X) the Commission based its decision heavily on this factors. Among the most important factors not explicitly stated in the merger guidelines, was the presence of a foreign firm (or firms) in the merger. We found robust results showing that the presence of a foreign firm in the merger increases the probability of a case being allowed. These results are robust to model specification and to the assumption made about the ordinality of the outcome variable.

Table III: Unconstrained Model: Multinomial Logit Results

	$V = V(H, Z)$			$V = V(H, Z, X)$		
	Allowed	Conditioned	Blocked	Allowed	Conditioned	Blocked
Constant		-8.47*** [3.43]	-19.87*** [4.92]		-7.85** [2.44]	-17.97*** [3.53]
Ln(HHI)		0.93*** [2.73]	2.20*** [4.03]		0.99** [2.31]	2.20*** [3.23]
HIST		0.34 [0.37]	1.35 [1.41]		0.63 [0.73]	2.24* [1.93]
EQ		2.10 [1.56]	5.80*** [3.52]		1.90 [1.19]	5.05*** [2.60]
EF		1.36** [2.12]	1.42 [1.00]		1.42** [2.15]	1.78 [1.19]
IMP		-0.64 [1.15]	-4.16** [2.36]		-0.76 [1.48]	-4.20** [2.28]
EB		0.53 [1.25]	-		0.43 [1.00]	-
MKT					-0.20 [0.32]	-1.16 [1.18]
FRG					-1.30** [2.68]	-2.43*** [2.61]

regulations or not. Among their conclusions the authors mentioned that the European Commission’s Merger Regulation has to be reinterpreted or amended in order to improve merger policy regarding the account of efficiency gains.

	Marginal Effects					
	Allowed	Conditioned	Blocked	Allowed	Conditioned	Blocked
ln(HHI)	-0.134	0.118	0.016	-0.132	0.122	0.010
HIST	-0.064	0.045	0.019	-0.117	0.087	0.030
EQ	-0.647	0.137	0.510	-0.502	0.245	0.257
EF	-0.263	0.249	0.014	-0.269	0.255	0.014
IMP	0.089	-0.071	-0.019	0.092	-0.080	-0.011
EB	-0.075	0.076	-0.001	-0.057	0.057	0.000
MKT				0.029	-0.024	-0.005
FRG				0.227	-0.204	-0.023
Observations		239			239	
Pseudo R2		0.19			0.23	

Notes: (1) Robust z-statistics in brackets; *, ** and *** represent statistical significance at 90, 95 and 99 percent level of significance, respectively. (2) All marginal effects of binary variables measure the effect of a change from 0 to 1. (3) “Allowed” is the base category.

V. Conclusions

Based on a newly created dataset with information on Mexican mergers, we estimate the probability that a would-be merger falls into any of three possible resolutions reached by the Mexican FCC: allowed, condition or blocked. Given the discrete nature of the problem and the unknown ordinality of the dependent variable, an ordered and a multinomial logit models were estimated. The results indicate that, overall, the FCC’s decisions are in fact reflecting a consistent application of the mergers provisions outlined in the Federal Economic Competition Law and expanded in the Merger Guidelines. Three variables included in the merger’s provisions have a significant and robust impact in the Commissions’ decision: market concentration, entry barriers and the equity share. A model containing just the variables explicitly mentioned in the mergers provisions would correctly predict 8 of every 10 Commission’s decision.

An alleged positive aspect of the Merger Guidelines has been their role in enhancing economic efficiency through the FCC's decision. Thus arguing that a merger should improve efficiency, the presence of such gains does not appear to benefit the bidding firm, on the contrary, its probability of being condition increases. Perhaps more surprising is the influence of factors such as the presence of a foreign firm among the would-be mergers, which do not appear explicitly in the merger provisions, but have, nevertheless, a significant effect on the Commission's decision.

A comparison of the results presented in this study and those from the large literature analyzing U.S. merger policy uncovers substantial differences in merger policy implementation between Mexico and the U.S. These differences emphasize the potential difficulties in achieving uniformity on criteria and coordination on this area. This is particularly worrisome given the increasing degree of economic integration between the two countries.

The paper represents a first attempt to understand the important process of implementing regulation policies in developing countries. Although much more economic structure is needed to perform an accurate assessment of Mexican regulation policies, we believe that future research should increasingly rely on empirical analysis while pursuing this aim.

Appendix 1

The Herfindahl *HHI* index, equal to the sum of the squares of the market shares, is a well known measure of market concentration that has been extensively used by many antitrust authorities around the world. One of *HHI*'s main properties is that its value unambiguously increases when, *ceteris paribus*, a merger takes place. However, as shown by Farrell and Shapiro (1990), some mergers can *increase* the level of competition rather than reducing it. Under these particular circumstances, the *HHI* would misinform the policy maker. The *DI*, on the other hand, may decrease following a merger between relatively small firms or a

small firm merging a relatively bigger one.³¹ Therefore, *DI* is better suited to measure changes in the level of competition as a result of mergers occurring within relatively small firms.

The *DI* can be expressed as:

$$DI = \frac{\sum_i s_i^4}{HHI^2}$$

where s_i represents the market shares of firm “*i*”, and *HHI* indicates the Herfindahl-Hirschman index. As in the case of the *HHI*, the *DI* is bounded between zero and one (or between zero and 10,000 if the shares are expressed in percentage terms). The main properties of the *DI* are:

Property 1. The value of the dominance index is larger than or equal to the value of the *HHI* with the equality holding only when all firms are of equal size.

Property 2. An output transfer from any one firm to the biggest firm will increase the value of the *DI* index. In the opposite sense, also an output transfer from the biggest firm to any other firm will reduce the *DI*.

Property 3. Any merger leading to a firm with more than half of the market increases the value of the *DI*.

Property 4. If there is one firm with more than half of the market, any merger not involving that firm reduces the value of the *DI*. This result is related with the threshold of the 50 percent market share established in the theory of IO. According to this criteria, any merger that entails a market share lower than 50 percent, as first screening, is not anticompetitive.

³¹ For a formal derivation and a discussion on the Dominance Index see García (1990).

Acknowledgement

The draft has benefited from thoughts and comments of a number of colleagues. However, the authors would like to specially thank the useful comments made by Malcolm Coate, Peter Holmes, Hans Timmer and seminar participants at the 33rd Conference of the European Association for Research in Industrial Economics, Amsterdam. Data and editorial assistance by Arturo Lamadrid and Amanda Bailey, respectively, are also appreciated. The usual disclaimer applies.

References

- Bergman, M., Jakobsson, M. and Razo, C. (2005) An Econometric Analysis of the European Commission's Merger Decisions. *International Journal of Industrial Organization*, **23**, 717-737
- Coate, M.B., Higgins, R.S. and McChesney, F.S. (1990) Bureaucracy and Politics in FTC Merger Challenges. *Journal of Law and Economics* **XXXIII**, 463-483.
- Coate, M.B. and McChesney, F.S. (1992) Empirical Evidence on FTC Enforcement of the Merger Guidelines. *Economic Inquiry* **XXX**, 277-293.
- Coate, M.B. (2005a) Empirical Analysis of Merger Enforcement Under the 1992 Merger Guidelines. *Review of Industrial Organization* **27**, 279-301.
- Coate, M.B. (2005b) Economic Models in Merger Analysis: A Case Study of Merger Guidelines. Potomac Working Paper in Law and Economics *05-04*.
- Davies, S.W., Driffield, N.L. and Clarke, R. (1999) Monopoly in the UK: What Determines Whether the MMC Finds Against the Investigated Firms? *The Journal of Industrial Economics* **XLVII**, 263-83.
- Fisher, F.M. (1987) Horizontal Mergers: Triage and Treatment. *Journal of Economic Perspectives*, **1**, 23-40.

- García, P.A. (1990) Un enfoque para medir la Concentración Industrial y su Aplicación para el Caso de México. *El Trimestre Económico* **2**, 317-341.
- Greene, W.H. (2003) *Econometric Analysis (Fifth Edition)*, Prentice Hall, New Jersey.
- Katzmann, R.A. (1980) Federal Trade Commission. In: Wilson, J.K., (Ed.) *The Politics of Regulation*, New York: Basic Books.
- Khemani, R.S. and Shapiro, D.M. (1993) An Empirical Analysis of Canadian Merger Policy. *The Journal of Industrial Economics* **41**, 161-177.
- Kouliavtsev, M. S. (2005) Some Empirical Evidence on the Effectiveness of Antimerger Relief in the United States. *Economic Inquiry* **XLIII**, 370-384.
- Levy, S. (2000) Observaciones sobre la Nueva Legislación de Competencia Económica en México. In: Tovar, L.R., (Ed.) *Lecturas en Regulación Económica y Política de Competencia*, pp. 167-179. México, D.F.: ITAM, Grupo Editorial Porrúa.
- Long, J.S. (1998) *Regression Models for Categorical and Limited Dependent Variables*. Advanced Quantitative Techniques in the Social Sciences Series, Sage Publications.
- McFadden, D.L. (1974) The Measurement of Urban Travel Demand. *Journal of Public Economics* **3**, 303-28.
- McFadden, D.L. (1984) *Econometric Analysis of Qualitative Response Models*. In: Griliches, Z. and Intriligator M.D., (Eds.) *Handbook of Econometrics*, pp. 1396-1446. Elsevier Science Publishers.
- Maddala, G. (1983) *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge: Cambridge University Press.
- Roller, L.H., Stennek J. and Verboven, F. (1999) Efficiency Gains from Mergers. *CEPR*, Report for European Commission, DGII.
- Posner, R.A. (1979) A Statistical Study of Antitrust Enforcement. *Journal of Law and Economics* **13**, 365-426.

Weir, C. (1992) Monopolies and Mergers Commission, Merger Reports and the Public Interest: a Probit Analysis. *Applied Economics* 24, 27-34.

Weir, C. (1993) Merger Policy and Competition: Analysis of the Monopolies and Mergers Commission's Decisions. *Applied Economics* 24, 57-66.

White, L.J. (1987) Antitrust and Merger Policy: A review and Critique. *Journal of Economic Perspectives* 1, 13-22 .