Research Statement
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My research centers on empirical industrial organization and applied econometrics. A common theme of my papers is the use of *structural models* that combine economic theory, modern econometrics, detailed data sets, and advanced computational methods to answer important policy questions. In contrast to *reduced form* econometrics, which focuses on describing existing empirical relationships between economic variables, a structural approach leverages insights from economic theory to better understand the fundamental mechanisms that drive the decisions of economic agents. Most notably, a structural model allows researchers to simulate the effects of counterfactual policies that have not been implemented yet.

The first strand of my research agenda focuses on empirically disentangling different sources of consumer inertia –in particular, network effects, switching costs, and search costs– and quantifying their effects on consumer welfare and the market power of firms. In industries with such market frictions, unregulated competition will often result in inefficient outcomes. The question of how to best design these markets is at the center of public discourse in many countries. Determining the optimal policy for a specific industry requires a careful quantification of the distinct channels that drive consumer behavior.

In the second strand of my research I quantify the level of intensity with which firms compete in oligopolistic industries. Reliably assessing to what extent firms compete or collude is one of the central questions in economics, because it has fundamental implications for the evaluation of firm markups, market efficiency, and antitrust policy. Without a comprehensive model of the strategic interaction of consumers and firms it is generally impossible to investigate how different sources of market power contribute to firms' pricing decisions. In this statement I describe my contributions to these two areas.

Consumer Inertia and Incumbency Advantages

Many industries are characterized by the presence of substantial consumer inertia. Three important sources of consumer inertia are switching costs, network effects, and search costs. *Switching costs* induce a consumer to prefer a product that she has already used in the past, for example, because there is an explicit fee to end a service contract, because of the perceived hassle associated with canceling a subscription, or because it requires effort to learn how to use a new product. *Network effects* induce a consumer to prefer a product that many other consumers already use. For example, when deciding on a social network site, it is likely that a consumer will choose the network that most of her friends already use. Finally, if consumers have to exert effort to learn about the characteristics of alternative products, they may prefer to not engage with the market at all and stick with their current products. Economists refer to the hassle associated with information acquisition as a *search cost*.

On the one hand, these three channels can incentivize firms to compete more aggressively for consumers or offer a more innovative product. On the other hand, the resulting consumer lock-in can make it easy for large firms to exploit their customers and prohibit smaller entrants from becoming viable competitors, even when they offer lower prices or better product quality.

The existing literature has mostly treated consumer inertia as a "black box" and has not distinguished its different channels. One contribution of my papers is to show that, in order to correctly measure the extent to which firms can exploit their customers, researchers need to quantify the relative importance and the interaction of different market frictions.

Therefore, understanding consumer preferences and the magnitudes of consumer switching costs, search costs, and network effects is essential for evaluating the efficiency of a market. Standard empirical models of demand and supply, that do not carefully distinguish the nuanced effects of different sources of consumer inertia, will generally lead to misleading policy conclusions.

In ***Network Effects and Switching Costs in the U.S. Wireless Industry*** (Weiergraeber, 2022) I develop and estimate a quantitative model of consumers' carrier choices with a particular focus on disentangling the role of switching costs and network effects. My model carefully takes into account the particular features of the industry. For example, I explicitly model that switching costs typically contain both an explicit *early-termination fee* (ETF), that a consumer may have to pay to end an existing contract prematurely, and unobserved hassle costs associated with the switching process.

Furthermore, I incorporate that during my sample period, many wireless contracts offer free unlimited on-net calls, which create *tariff-mediated network effects* (TMNEs) and make consumers prefer a carrier that many other consumers already use.

A particularly difficult problem in such a model is how to accurately measure *network effects*. From observing only the aggregate industry structure one can typically not determine whether a dominant carrier offers high-quality service and therefore attracts many customers or whether consumers prefer to be on the same network as their peers even if the stand-alone service quality is low.

I overcome this challenge by combining my model with a detailed data set that has two special features. First, my data contain market shares and customer churn rates of carriers disaggregated by different demographic consumer types and by local markets. Second, my sample covers the period in which all major wireless carriers eliminated TMNEs from their contracts. Intuitively, this allows me to compare consumer decisions in markets in which TMNEs are abolished with choices in markets in which TMNEs are in place to quantify the network effect.

I use my model estimates to simulate policies that regulators or carriers may consider to increase customer mobility, such as switching subsidies (*poaching payments*) or making networks perfectly compatible, i.e., eliminating network effects. A key contribution of this paper is to illustrate that it is essential to employ a demand model that explicitly incorporates both switching costs and network effects. Using a simpler model that does not distinguish the two channels, as is typically done in the literature, will result in erroneous policy conclusions. For example, when ignoring network effects a carrier may underestimate its revenue gains from offering a US-$ 600

poaching payment by up to US-$ 450 million per month. My model framework can readily be applied to study consumer preferences in other industries with similar features, most notably the demand for software platforms.

My paper ***Alert the Inert? Switching Costs and Limited Awareness in Retail Electricity Markets*** (Dressler and Weiergraeber, 2023) is motivated by the observation that different countries have taken different approaches to organize their retail electricity markets.

For example, in the 1990s most European countries liberalized the market in the hope that competition among electricity retailers would bring down prices. Even more than 20 years after the liberalization prices have not come down significantly, and many consumers have constantly remained with the incumbent provider. Most U.S. states have followed a different approach and continue to have a regulated monopolist operate the market. A regulated monopolist eliminates all market frictions, because consumers do not have to make a conscious choice; however, it also eliminates contract variety and competition among firms. Which of the two market forms generates higher consumer welfare is theoretically not clear, and therefore an important empirical question.

From a methodological perspective, our paper contributes to the recent literature that estimates demand models that take into account that many consumers are unaware of some of the available products. In particular, we not only model how consumers choose among contracts, but also whether and how they acquire information about the market.

A key advantage of our approach is that we can combine several distinct data sets in one estimation procedure. Specifically, we combine data on market shares, advertising, Internet usage data, and individual-level consumer surveys. This allows us to obtain more detailed insights into the different determinants of consumer decisions than existing studies.

We use our model to simulate several policy measures and alternative forms of organizing the market. Among others, our analysis provides empirical evidence that the hoped-for gains from competition in retail electricity markets may be much harder to materialize than many expected. Given consumers' current level of search and switching costs, a well-regulated monopolist is likely to generate higher consumer welfare than a liberalized market.

In some industries incumbency advantages may not arise from consumer inertia but because the incumbent firm has better access to information about the market. In ***Bidder Asymmetries in Procurement Auctions: Efficiency vs. Information*** (Carnehl and Weiergraeber, 2023) we study such a setting. Our paper contributes to a better understanding of why in the market for short-haul railway passenger services in Germany the former state monopolist remains by far the dominant service provider. We develop a model of procurement auctions and show theoretically that both a more efficient cost structure and superior information about market demand can rationalize a dominant firm; however, the two channels have opposite welfare implications.

We are the first to empirically disentangle these two asymmetries, which allows us to determine the reason underlying the apparent incumbency advantage and assess the efficiency of the

market. From a methodological perspective, this paper contributes to the still nascent literature on auctions in which bidders have to combine several pieces of information to compute their optimal bid.

In some of my more recent work, I provide novel insights about the identification of economic agents' time preferences, i.e., how they trade-off future utility against present utility. Most researchers assume that the intertemporal behavior of an agent is consistent over time. An increasing body of experimental evidence indicates that this is not the case, however. For example, individuals often discount *hyperbolically*, so that they experience *present-bias*, i.e., they place disproportionately more weight on their utility today than their future. In ***Identification of Dynamic Discrete Choice Models with Hyperbolic Discounting Using a Terminating Action*** (Wang *et al.*, 2022) we show formally how the presence of a *terminating action*[1] allows us to quantify an agent's time preferences with fewer data requirements and less restrictive assumptions than what is used in the existing literature. Our method can be used, for example, to shed new light on decisions about debt payments or technology adoption.

Work-in-progress:

In ***Product Proliferation in Markets with Switching Costs*** (Shcherbakov and Weiergraeber, 2022), we quantify to what extent switching costs prevent consumers from benefitting from increased product variety in the U.S. wireless industry. From a methodological perspective, we are the first to estimate a demand model that incorporates both persistent consumer heterogeneity and time-varying taste-shocks that are correlated at the wireless carrier level. This enables us to illustrate a subtle, but important, difference between two demand models commonly used in empirical analyses: The *random coefficient logit model* and the *nested logit model* are generally considered as isomorphic in settings without switching costs. We show theoretically and with our estimation results that the two models can yield very different predictions in applications with switching costs.

In ***The Welfare Effects of Price Caps in Search Markets*** (Paz y Miño and Weiergraeber, 2022b) we analyze a novel data set on the prices of all grocery retailers in Montevideo, Uruguay. We investigate how a policy that imposed price ceilings on many grocery items in the summer of 2020 affected consumer welfare. Typically price ceilings are imposed to protect consumers from increasing prices. In markets where consumers engage in costly search before buying a product, however, it is possible that such a policy leads to reduced search effort and higher equilibrium prices.

To quantify the effects of the price cap policy, we estimate a structural model of consumer search and retailer pricing in the style of Wildenbeest (2011). We find that on average consumers find it marginally more costly to search for better prices during the COVID pandemic. Moreover, search costs during the COVID pandemic are more homogeneous across consumers compared to the pre-pandemic period. Finally, our preliminary estimates indicate that the price cap policy had heterogeneous effects on different demographic consumer types.

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[1]A *terminating action* is a choice that ends a dynamic decision problem immediately.

Estimation of Industry Conduct

In the second strand of my research, I quantify how intensely firms compete in oligopolistic industries with differentiated products. In these industries two sources contribute to the market power of firms. First, firms may be able to charge high prices because they offer a unique high-quality product that tailors well to consumers' tastes, as is, for example, the case with Apple's iPhone. Second, firms may coordinate their prices to increase their profits at the expense of consumers.

Assessing to what extent firms compete or collude when setting their prices, i.e., determining the prevailing *industry conduct*, is one of the central questions in economics, because it has fundamental implications for evaluating consumer welfare, firm markups, market efficiency, and antitrust policy. Over the last years, there has been a heated debate about how much firms' markups, i.e., the differences between a product's price and its (marginal) cost of production, have risen over time, see, for example, De Loecker *et al.* (2020) and Berry *et al.* (2019). Without a comprehensive model of the strategic interaction of firms it is generally not possible to quantify how different channels contribute to firms' pricing decisions.

There is a seminal literature in industrial organization discussing that, in principle, it is possible to determine empirically whether firms compete or collude, see, for example, Bresnahan (1982); Berry and Haile (2014). Taking their abstract arguments to specific data sets has remained challenging, however. The main reason is that the type of data that their arguments traditionally rely on often exhibits too little variation to allow for precise statistical inference about industry conduct. These limitations have led most of the literature to either assume a specific form of conduct or to focus on estimating relatively restrictive patterns of firm behavior. Such an approach is likely to mask important heterogeneity across firms and trends over time.

In ***Estimating Industry Conduct Using Promotion Data*** (Michel, Paz y Miño and Weiergraeber, 2023) we contribute to this literature by quantifying detailed patterns of industry conduct in the U.S. ready-to-eat (RTE) cereal industry. We develop a structural model that carefully takes into account the institutional particularities of the industry both on the demand and the supply side. To empirically discriminate different types of firm conduct, we exploit data on temporary promotions to construct novel *instrumental variables*.[2] Our instrumental variables rely on an important institutional feature of consumer packaged goods (CPG) industries: Since for logistical reasons the timing of promotions is determined several months in advance, promotions cannot be adjusted immediately in response to contemporaneous cost shocks. Moreover, promotions affect consumers' purchase decisions and therefore affect firms' optimal markups. How firms' adjust their markups to these shifts in demand is informative about the prevailing industry conduct. Our empirical model is general enough to be applied to many other CPG industries.

Our empirical findings are important from a policy perspective for several reasons. First, we provide evidence about how a merger can structurally change the behavior of firms that are not part of the merger, and that such *coordinated effects* deserve careful attention when reviewing

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[2]Econometricians use instrumental variables to control for the confounding effects of other unobserved explanatory variables.

merger proposals. Second, we provide novel insights into how firms punish their rivals during a price war period. This is a topic that has received a lot of attention from the theoretical literature. Empirical evidence on this topic is still scarce, however.

Work-in-progress: The research that I conducted for Michel *et al.* (2023) has resulted in several work-in-progress projects on antitrust and competition policy. In ***The Competitive Effects of Price Promotions*** (Paz y Miño and Weiergraeber, 2023) we extend our model setup to a dynamic industry conduct model that endogenizes both promotional activities and list prices. We plan to apply this framework to the RTE cereal industry to document to what extent conduct differs across list prices and promotional prices, which allows us to analyze in more detail the distributional effects of anticompetitive pricing behavior.

In ***How Effective Are Antitrust Penalties?*** (Paz y Miño and Weiergraeber, 2022a) we analyze the recent canned tuna cartel in the U.S. with a focus on two questions. First, we are interested in how effective antitrust policy is in preventing future collusive pricing. This question is motivated by the striking observation that we do not observe a significant price decrease for canned tuna neither after the Department of Justice opened its investigation nor after firms were fined for collusive pricing.

Second, we regard this case as an ideal setting for assessing the importance of two understudied determinants of the economic incidence of the harm caused by a cartel: A defendant in a collusion case may claim that the plaintiff, usually a buyer, for example, a retail chain, did not incur the sued-for damages, because it was able to pass on the higher wholesale prices to final consumers. So far there is no legal consensus on whether this *pass-on defense* is permissible, and there is little empirical evidence to what extent retailers are able to engage in such pass-on pricing. In addition, *umbrella effects* may allow a retailer to benefit from higher wholesale prices for national brands by being able to increase the prices of its private label products, which creates additional harm to consumers.

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