William Matcham: Research Statement

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I am an applied economist with research interests spanning household finance, industrial organization, innovation, and econometrics. My research uses novel, granular datasets to estimate quantitative models, delivering answers to economic questions in important markets containing active policy debates. My two main projects study the industrial organization of the UK credit card market and the efficiency of the US patent screening process. In this statement, I summarize these two main projects and explain how they are each embedded in broader research agendas I will build on after completing my Ph.D. I also have ongoing research in applied econometrics, which I describe briefly in the final section.

Industrial Organization and Regulation of the UK Credit Card Market

Credit card lenders attempt to minimize the deleterious effects of information asymmetries by tailoring contract terms to predictions of customers' unobservable risk. Governments, on the other hand, aim to ensure that contracts are simple and transparent so that consumers are not misled and can search effectively across lenders. Resultantly, regulation has limited the extent to which lenders can tailor certain features of credit contracts according to risk. My job market paper constructs and estimates a structural model of the UK credit card market to investigate how lender heterogeneity and credit card regulation affect the way that lenders individualize contracts according to risk.

To study this topic, I use novel statement-level data on approximately 80 percent of all UK credit cards active between 2010 and 2015. Among other advantages, the data include lenders' proprietary risk scores for every origination. Using these risk scores, I show that credit limits are risk-based and vary substantially across customers within lenders. Further, I find heterogeneity across lenders in (i) the shape of credit limit distributions and (ii) the mapping from credit scores into credit limits. On the contrary, I find minimal within-lender variation in interest rates. This finding is rationalized by UK credit card regulation, which requires that (i) lenders advertize one interest rate for each credit card and (ii) at least 51 percent of customers on each card are granted the advertized APR or lower when they originate. Despite the constraint being set at 51 percent, I find that between 80 to 90 percent of customers obtain the advertized APR in each month.

Based on these descriptive patterns and the institutional environment, I construct and estimate a structural model of the UK credit card market. I identify model parameters using an instrumental variable relating to the 2011 UK High Court case on the mis-selling of Payment Protection Insurance. My parameter estimates imply substantial variation in the precision of lenders' risk predictions. Additionally, I find that the precision of lenders' risk predictions correlates positively with the proportion of customers who use their credit card for borrowing. This is consistent with

a segmentation of credit card lenders in which lenders with the least sophisticated screening technologies serve a safer segment of the market on average. Lenders with more precise screening technologies are more willing to serve customers who may default on a revolving balance because they can set lower credit limits for customers they pinpoint as riskier in a more accurate manner.

Finally, I use the model to understand the effect of the institutional environment on lenders' credit limit and interest rate choices. Specifically, I analyze a counterfactual scenario in which lenders face no constraints—regulatory or otherwise—in individualizing interest rates. The distribution of interest rates moves from a small set of card-level interest rates to a more continuous, individual-level distribution, implying increased price discrimination. Since lenders opt for individualized pricing when there are no constraints in doing so, the existing environment impose meaningful restrictions on lenders. This further motivates lenders' use of risk-based credit limits to manage customers' default risk in the existing context.

This project is part of a broader research agenda investigating how particular features of financial products and their regulatory environments shape how lenders tailor contracts according to risk. No general theory exists to explain how product features and regulatory environments interact to influence lenders' choices amongst multiple screening instruments. For example, mortgages and credit cards across UK and US markets all feature different combinations of risk-based contractual characteristics. Understanding why will deliver insights into the functioning of markets with information asymmetries and enable more effective regulation, where considered necessary.

Incentives, Motivated Agents, and Bargaining in the Patent System
My second major research project—co-authored with Mark Schankerman—studies how incentives and organizational design in public institutions affect the efficiency of resource allocation, specifically in the context of the US patent screening process.

We develop a dynamic structural model of the patent screening process, which incorporates incentives, intrinsic motivation, and the institutional bargaining structure. We estimate the model using novel data covering around 24 million examiner decisions on patent claims and modern natural language processing methods.

We evaluate counterfactual reforms that change incentives for the patent examiners, fees for the patent applicant, and the structure of the negotiation process. We quantify the effects of the counterfactual reforms along two dimensions: the accuracy of screening and the timeliness of patent examination. One striking finding from the counterfactual exercises is that faster resolution of patent applications typically coincides with *fewer* cases where the examiner grants invalid claims, a result only possible in a model where inventors' application choices are endogenous.

Even though there is generally a trade-off between timeliness and accuracy, one reform represents an unambiguous improvement over the examination structure currently used by the Patent Office.

We find that imposing a limit on the number of negotiation rounds reduces the average number of negotiation rounds by 13 percent and, at the same time, reduces both grants to invalid claims by six percent and abandonment of valid claims by eight percent.

This paper offers insights into how resource allocations in public agencies similar to the US Patent Office can be improved and extensions to patent screening processes in other countries are natural. However, I acknowledge that certain features of the patent screening context may not generalize, so I am motivated to estimate structural models of other public agencies. I am in contact with Cancer Research UK about obtaining data on their process for allocating research grants and know of interest in extending the broad ideas of the paper to the context of National Institutes of Health grants.

Applied Econometrics

My main working paper in econometrics is "Multivariate Ordered Discrete Response Models", joint authored with Tatiana Komarova (LSE). In this paper, we generalize multivariate ordered choice models, allowing for interdependence in an agent's decision process across multiple dimensions. Existing efforts to estimate multiple ordered choice models typically impose that decisions across multiple dimensions are based on independent decision rules linked only through potentially correlated unobservables. From the perspective of behavioral economics, existing models (which we term lattice models) correspond to narrow bracketing in decision-making. For example, an investor who decides *separately* whether to participate in the stock and bond market is a narrow bracketer. An investor who decides *jointly* on stock and bond market participation brackets broadly. Our central contribution is to introduce, identify, and estimate multivariate ordered discrete response models that correspond to broad bracketing in decision-making, which we call non-lattice models.

We start by formally defining lattice, non-lattice, and an intermediate class of hierarchical models. In these three cases, we specify latent processes as a sum of an index of covariates and an unobserved error, with unobservables for different latent processes potentially correlated. We provide conditions sufficient to guarantee identification under the independence of errors and covariates, compare these to identification conditions in lattice models, and outline an estimation approach. We finish with simulations and empirical examples, focusing on probit specifications.