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RESEARCH INTERESTS	Primary: Industrial Organization, Applied Econometrics Secondary: Trade, Labor, Computational Methods	
DISSERTATION	Title: Essays in Productivity and Trade Advisor: Professor Amil Petrin	
EDUCATION	University of Minnesota Ph.D. in Economics (2018) M.A. in Economics (2016) University of Toronto M.A. in Economics (2012) University of Manitoba B.A. (First Class Honours) in Economics (History Minor) (2010)	
WORKING PAPERS	“How Substitutable are Labor and Intermediates?” (Job Market Paper) “Trade, Occupation Sorting and Inequality” (with Ming Xu) “The Impact of Research and Development on Quality, Productivity and Welfare” (with Amil Petrin and Frederic Warzynski) “Allowing for Heterogeneous Preferences over Unobserved Quality in Random Coefficient Demand Models” (with Amit Gandhi, Kyoo-il Kim and Amil Petrin)	
INVITED CONFERENCE PRESENTATIONS	“How Substitutable are Labor and Intermediates?” presented at the International Industrial Organization Conference (Indianapolis, 2018); Danish International Economics Workshop (Aarhus, 2017); Annual Conference of the Canadian Economic Association (Ottawa, 2016) “Trade, Occupation Sorting and Inequality,” presented at the Mid-west Macro Meeting (Baton Rouge, 2017); North American Summer Meeting of the Econometric Society (Philadelphia, 2016); Aarhus University Lunch Seminar (Aarhus, 2015); Annual Conference of the Canadian Economic Association (Toronto, 2015). “Allowing for Heterogeneous Preferences over Unobserved Quality in Random Coefficient Demand Models,” presented (by a coauthor) at the North American Summer Meeting of the Econometric Society (St. Louis, 2017).	
SEMINAR PRESENTATIONS	2018: Aarhus University, Bank of Canada, Federal Reserve Bank of Atlanta, Federal Reserve Bank of Minneapolis, Georgetown University in Qatar, McGill University, McMaster University, Pennsylvania State University, Queen’s University, Ryerson University, UBC Sauder School of Business, University of Cambridge, University of Copenhagen, University of Toronto, University of Western Ontario, York University.	

INVITED RESEARCH VISITS	Research Department, Federal Reserve Bank of St. Louis (August 2017) School of Business and Social Sciences, University of Aarhus, Denmark (October 2015, June 2017)	
AWARDS AND CERTIFICATES	Best Rising Star Paper Prize (International Industrial Organization Conference, 2018) Richard L. Sandor Dissertation Fellowship (Minnesota, 2017) Doctoral Dissertation Fellowship (Minnesota, 2016) COGS Travel Grant (Minnesota, 2016) Graduate Research Partnership Program Fellowship (Minnesota, 2016) First Place, Hardy Third-Year Paper Competition (Minnesota, 2015) Distinguished Teaching Assistant (Minnesota, 2014 & 2015) Herbert Mohring Fellowship in Economics (Minnesota, 2013) CLA Graduate Fellowship (Minnesota, 2012) CGS Doctoral Fellowship (SSHRC, 2012-2016) Graduate Fellowship (Toronto, 2011) Joseph-Armand Bombardier Canada Graduate Scholarship (SSHRC, 2011) Faculty Gold Medal in Honours (Manitoba, 2010) Dr. A.W. Hogg Scholarship (Manitoba, 2009) Isbister Scholarship (Manitoba, 2009) UMSU Scholarship (Manitoba, 2009)	
REFEREE SERVICE	<i>Quarterly Journal of Economics</i> , <i>Journal of Industrial Economics</i> , <i>Structural Change and Economic Dynamics</i>	
TEACHING EXPERIENCE	Teaching Assistant (Department of Economics, University of Minnesota, 2013-2015) <ul style="list-style-type: none"> • Courses: PhD Applied Econometrics, International Trade, Principles of Microeconomics, Principles of Macroeconomics Teaching Assistant (Department of Economics, University of Toronto, 2011-2012) <ul style="list-style-type: none"> • Courses: Environmental Economics, Principles of Economics 	
PROFESSIONAL EXPERIENCE	Research Assistant (Prof. Amil Petrin, Dept. of Economics, 2015-2017) Research Assistant (Prof. Kyle Herkenhoff, Dept. of Economics, 2015) Research Assistant (Prof. Jose Victor Rios-Rull, Dept. of Economics, 2014) Research Assistant (Prof. Thomas Holmes, Dept. of Economics, 2014) Research Analyst (Federal Reserve Bank of Minneapolis, 2014-2015)	
TECHNICAL SKILLS	Fortran, Matlab, Stata/Mata, MPI, Python, SAS, Mathematica, LaTeX.	
DATA ACCESS & EXPERIENCE	FIDA (Statistics Denmark), LBD and CFS (Special Sworn Status, U.S. Census Bureau), Equifax Consumer Credit Panel (Federal Reserve), NLSY, CPS, PSID, SIPP, OES.	
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ABSTRACTS

“How Substitutable are Labor and Intermediates?” (Job Market Paper)

Empirical models of production often impose input complementarity and rule out an extensive margin in the decision to “make or buy” inputs. This paper develops a simple model of production which generalizes the standard Cobb-Douglas approach and allows labor and intermediates of similar types (or “tasks”) to be complements, substitutes, or (importantly) outsourced entirely. Modeling this “make or buy” decision directly allows me to correct for selection bias resulting from the endogenous outsourcing decision and to characterize the extensive margin of factor demand. I take the model to unique Danish data on task-level purchases of disaggregated labor (e.g. truck drivers), goods, and services (e.g. shipping) and find that labor and intermediates are gross substitutes. Estimated elasticities of substitution range from 1.5 to 4, with positive cross-price elasticities between 0 to 2 across inputs and industries. Aggregating across firms, I show that demand for labor is becoming increasingly price elastic over time, driven by growing outsourcing and specialization. To illustrate the importance of allowing for flexible substitutability, I examine the effect of an increase in minimum wages in the Danish manufacturing industry, finding that ignoring outsourcing underestimates unemployment by 40%. This also has important implications for estimating productivity. I estimate the effect of recent decreases in Danish import tariffs on firm productivity and show that controlling for substitution triples the results relative to benchmark models which only control for price effects.

“Trade, Occupation Sorting, and Inequality” (with Ming Xu)

Firms react to changes in factor prices with intensive and extensive-margin employment adjustments at the occupational-level. We study the distributional and aggregate consequences of this make-or-buy dynamic by developing a novel network model of heterogeneous firm-to-firm trade where the boundary of each firm depends on factor prices and firm-occupation comparative advantage in input-production. We show that the model can be easily aggregated and taken to industry-level data, and use the calibrated model to examine recent trends in employment, wages and trade in the USA. We use public OES and CPS data to show empirical evidence that a significant fraction of the growth in wage inequality in the USA is due to changes in firm/industry specialization and occupation sorting. To understand and measure the underlying causes of these trends, we calibrate the model to occupation and industry data from the OES and input-output tables. The results suggest that 1/3rd of the increases in wage inequality stem from decreases in inter-industry trade frictions with the remaining 2/3rds stemming from changes in technology and labor supply. Falling trade frictions are also responsible for all of the increases in occupational sorting and concentration. Had trade frictions been held at their 2002 level, productivity growth would have led to an increase in vertical integration, rather than the decrease observed in the data.

“Allowing for Heterogeneous Preferences on Unobserved Quality in Random Coefficient Demand Models” (with Amit Gandhi, Kyoo il Kim and Amil Petrin)

In this paper we study a class of random utility models that allows for horizontal product differentiation to enter an otherwise purely vertically differentiated market. The model generalizes the standard random coefficient model by allowing for consumer heterogeneity to interact with a product’s unobserved attribute. We seek to establish three basic results concerning this model that is relevant for empirical work. First, the discrete choice demand literature to date allows for heterogeneous preferences on observed characteristics, but not on unobserved characteristics. This is potentially problematic, as in empirical settings much of demand loads on unobserved product quality. Allowing for heterogeneous preferences over this unobserved quality (which might represent reliability, marketing, style, or other unmeasured product characteristics) thus has an obvious economic interpretation which is useful for the purposes of measuring product quality and demand. Second, a key issue in generalizing the model in this way is that the standard computation method does not apply to this model, as the conditions under which the standard mapping is a contraction are no longer generally satisfied. Third, we establish conditions under which the generalized model is both identified and has a globally convergent solution method.