

Micro to Macro: How to Use Data When You Have no Data

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- In the last couple of decades the field of international trade has become increasingly quantitative
- This is due to two major developments driven by easier accessibility of individual datasets and higher computing power:
 - ① Econometric works to study *ex post* the implications of firms' and workers' heterogeneity for the sources, the patterns and the gains from trade
 - ② Calibration and simulation of statistical models to investigate *ex ante* the (welfare) implications of counterfactual scenarios for which data are necessarily unavailable (e.g. Brexit)
- For lack of better name, call the latter models “*new quantitative trade models*”:
 - \implies We should care about the detail of micro reallocations only if this changes our understanding of the aggregate gains from trade

New Quantitative Trade Models (NQTM)

- The idea of using mathematical or statistical models to simulate the effects of counterfactual scenarios has a long tradition (Baldwin and Venables, 1995)
- In particular, 'Computable general equilibrium' (CGE) models remain a cornerstone of trade policy evaluation
- To this tradition NQTMs contribute:
 - A tighter connection between theory and data thanks to more appealing micro-theoretical foundations
 - A more careful estimation of the structural parameters necessary for counterfactual analysis

Eaton and Kortum (2002) and Melitz (2003)

- The trailblazer NQTM is arguably the statistical model proposed and structurally estimated by Eaton and Kortum (2002) to quantify the effects of counterfactuals on trade liberalization and technological progress in 19 OECD countries
 - However, by assuming perfect competition, the Eaton-Kortum model does not speak directly to the parallel research line based on individual heterogeneity, of which the main theoretical reference is Melitz (2003)
- Introducing heterogeneous firms in Krugman (1980), Melitz (2003) provides a theoretical framework consistent with several stylized facts highlighted by the analysis of firm-level datasets
 - But its initial applications did not include counterfactual simulations

Bridging Micro and Macro: Early Attempts

- Early attempts at bridging the two lines of research can be found in Bernard, Eaton, Jensen and Kortum (2003) and Del Gatto, Mion and Ottaviano (2006) – see also Di Mauro, Ottaviano and Taglioni (2009)
- Both papers apply the standard macroeconomic methodology of ‘calibration, validation and simulation’ for counterfactual analysis:
 - 1 *Calibration* requires the values of the theoretical parameters to be set such that the model matches *some key moments* of the data
 - 2 *Validation* requires the calibrated model to be able to match *other moments* of the data different from those used for calibrating
 - 3 *Simulation* of counterfactual scenarios can be ‘reasonably’ performed only if the calibrated model passes the validation checks

Bridging Micro and Macro: Arkolakis, Costinot and Rodriguez-Clare (2012)

- In several respects, Eaton and Kortum (2002) and many variations of Melitz (2003) belong to the same family of models
- All models in this family share the same predicted 'gains from trade' (defined as welfare with trade relative to welfare with autarky), conditional on the changes in two aggregate statistics:
 - \implies The observed share of domestic expenditure and an estimate of the trade elasticity
- These models share *four primitive assumptions*: (a) Dixit-Stiglitz preferences; (b) one factor of production; (c) linear cost functions; (d) perfect or monopolistic competition
- They also share *three common macro-level restrictions*: (A) trade is balanced; (B) aggregate profits are a constant share of aggregate revenues; (C) the import demand system exhibits constant elasticity of substitution (CES)

An Impossibility Theorem?

- As this set of assumptions is extremely restrictive, the finding by ACR could be dismissed as some sort of 'impossibility theorem' with very limited practical relevance
- What makes their finding interesting is that some of the most popular trade models do satisfy those restrictive assumptions such as Armington (1969), Krugman (1980), Eaton and Kortum (2002) and several variations of Melitz (2003)
- In this respect, the main contribution of ACR is to theoretically define the main class of state-of-the-art NQTM

“New Trade Models, Same Old Gains?”

- Do ACR show that the micro details of NQTM are irrelevant for the quantification of the aggregate welfare effects of counterfactual shocks?
- Not really:
 - \implies Different models of the ACR family often produce very different predictions for the same counterfactuals (Costinot and Rodriguez-Clare, 2014)
- Current debate has mostly focused on *first moment* of aggregate welfare changes:
 - \implies How much countries gain/lose
- Another interesting way to check robustness is to look at *higher moments*:
 - \implies How gains/losses are distributed across countries

A Simple Example from CR

- Welfare losses of a 40% increase in worldwide import tariffs for 20 European countries
- Let's look at correlations of losses across countries generated by different NQTM

	Without Intermediates			With Intermediates		
	Perfect Competition	Monopolistic Competition		Perfect Competition	Monopolistic Competition	
		Krugman (1980)	Melitz (2003)		Krugman (1980)	Melitz (2003)
	(1)	(2)	(3)	(4)	(5)	(6)
(1)	1	-0.72098	-0.72613	0.998883	-0.63709	-0.72288
(2)		1	0.974937	-0.75233	0.986991	0.933616
(3)			1	-0.75753	0.932363	0.835422
(4)				1	-0.67063	-0.74652
(5)					1	0.955704
(6)						1

Source: Author's elaboration based on percentage losses from Table 3 in Costinot and Rodriguez Clare (2014).

- While considering intermediates mostly affects the average losses, the choice of market structure also affects the cross-country distribution of losses

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- The predictions of NQTM's on the average welfare effects seem to be quite sensitive to considering or not intermediate goods
 - \implies More attention to I-O linkages and GVCs, seller-buyer relations
- The predictions of NQTM's seem on the distribution of welfare effects seem to be very sensitive to the choice of market structure
 - \implies More attention to the actual market structures that characterize different sectors
- NQTM's are mostly silent on the 'dynamic' effects that policy intervention may have on economic growth
 - \implies More attention to competition, innovation and technology adoption

Micro for Macro: How to Use Data When You Have no Data (Cont.)

- Validation has increasingly gone missing in NQTM's ('exactly identified' instead of 'overidentified' models)
 - \implies Micro data are a mine of additional moments for validation
- But even the 'four primitive assumptions' have implications that are clearly at odds with key features of firm-level data
 - \implies More attention to demand characteristics, markup behavior, passthrough from input prices to output price, intensive margin reallocations
- To sum up:
 - \implies Simulated macro models are needed to quantify the aggregate implications of counterfactual scenarios for which data are by definition not available
 - \implies Micro data can be used to discipline the *structure* of macro models and to validate their calibration
 - \implies CompNet data have a unique potential in this respect