

Incorporating Melitz into WiNDC

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Abstract

The Melitz model of heterogeneous firms in production (2003) has provided new insights into the behavior of international trade and production. While its specification is relatively parsimonious, it can prove difficult to implement in the framework of a general equilibrium simulation. Relying on the work of Balistreri and Tarr (2022a,b), this paper extends the canonical WiNDC model as published by the Wisconsin National Data Consortium (<https://windc.wisc.edu/>). We replace the classical CES production function of the WiNDC model with a heterogeneous firms model consistent with Melitz.

1 Introduction

The Melitz model (Melitz, 2003) has provided new insights into the behavior of international trade and production. While its specification is remarkably parsimonious, it can prove difficult to implement in the framework of a general equilibrium simulation. Relying on the work of Balistreri and Tarr (2022a,b), this paper extends the canonical WiNDC model as published by the Wisconsin National Data Consortium (<https://windc.wisc.edu/>). We replace the classical CES production function of the WiNDC model with a heterogeneous firms model consistent with Melitz. Additionally, consumer welfare benefits from the variety effect in Melitz. Consistent with Balistreri and Tarr (2022a,b), we also introduce other features, such as labor-leisure choice.

With the new Melitz-augmented model, we conduct experiments consistent with the Armington and Melitz cases of Balistreri and Tarr’s Economic Inquiry paper to assess the responsiveness of welfare gains in the model to global reductions in tariff barriers. If time permits, we would also like to explore the implications of the Melitz relative to Armington structure on carbon emissions and carbon leakage under varying tariff and carbon tax scenarios. Because the Melitz model yields greater export growth among more productive firms, we expect that modeled emissions and carbon leakage will be lower under Melitz than under Armington.

2 Data

The starting point for our model is the current release of WiNDC 4.0.¹ This paper uses GTAP version 11a, to build a 2017-baseline version of the dataset. The initial versions of the model are aggregated to four sectors: Agriculture, a portion of Manufacturing, and Services all feature constant returns to scale and follow the original Armington structure. The remainder of Manufacturing is modeled following Melitz. Similarly the number of regions is restricted to four in the original case: North America, Europe, Asia, and Rest of World. This simplified 4x4 model will serve as our testbed for the Melitz model features.

¹The WiNDC buildstream is available for download at <https://windc.wisc.edu/downloads.html>. Version 4.0, released in September 2023, includes code necessary to build both the WiNDC and GTAP-WiNDC datasets. The buildstream can accommodate GTAP version 9 (publicly available) or GTAP 11 or 11a (license required)

3 Model

4 Results

5 References

References

- Balistreri, Edward J. and David G. Tarr**, “Mathematics of Generalized Versions of the Melitz, Krugman and Armington Models with Detailed Derivations,” *Journal of Global Economic Analysis*, 2022, 7 (2). <https://doi.org/10.21642/JGEA.070203AF>.
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- Melitz, Marc J.**, “The impact of trade on intra-industry reallocations and aggregate industry productivity,” *Econometrica*, 2003, 71 (6), 1695–1725. <http://www.jstor.org/stable/1555536>.