The More We Die, The More We Sell? A Simple Test of the Home-Market Effect

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The Quarterly Journal of Economics (2019)

October 16, 2025

Presentation and Critical Analysis by: An International Trade Researcher

Motivation & Research Question

A Foundational Idea in International Trade:

- The **Home-Market Effect** (Linder, 1961; Krugman, 1980): Countries with large domestic demand for a product tend to become net exporters of that product.
- This is a core prediction of **New Trade Theory**, which emphasizes increasing returns to scale.

The Key Empirical Challenge:

- **Endogeneity.** How to isolate the *causal* effect of demand?
- Previous tests used expenditure shares, but expenditure is an equilibrium outcome affected by both supply and demand. This leads to biased and inconclusive results.

This Paper's Research Question:

Question

Can we find a clean, exogenous source of variation in home demand to provide a definitive test of the home-market effect?

Contribution: A Novel Identification Strategy

The paper's core innovation is its empirical strategy, applied to the global pharmaceutical industry.

Step 1: Predict Disease

- Use a country's exogenous **demographic composition** (age, gender).
- Combine with global disease prevalence rates for each demographic group.

Step 2: Predict Demand

- This creates a **"Predicted Disease Burden" (PDB)** for each country and disease.
- PDB serves as a plausibly **exogenous demand shifter** for drugs treating that disease.

The Logic

Demographics → Predicted Disease → Exogenous Home Demand for Drugs

This allows for the first clean test of the home-market effect's causal claim.

Theoretical Framework: Weak vs. Strong Effects

The authors build a model to derive two precise, testable hypotheses. Bilateral sales from exporter *i* to importer *j* are modeled as:

$$\ln(x_{ij}^n) = \text{Fixed Effects} + \beta_M \ln(\text{Demand}_j^n) + \beta_x \ln(\text{Demand}_i^n) + \varepsilon_{ij}^n$$

1. **Weak Home-Market Effect:** $\beta_x > 0$
   - A larger home demand in the exporting country (*i*) increases its foreign sales.
   - **Crucial Insight:** This effect is only possible with **economies of scale** (a downward-sloping supply curve). Without them, higher home demand would raise prices and *reduce* exports.
2. **Strong Home-Market Effect:** $\beta_x > \beta_M$
   - The boost to exports from home demand is larger than the boost to imports from foreign demand.
   - This implies the country becomes a **net exporter**.
   - Requires *sufficiently strong* economies of scale.

Data Sources

The analysis links two main datasets for a 2012 cross-section:

Bilateral Sales Data

IMS MIDAS Dataset

- Comprehensive data on pharmaceutical sales for 56 countries.
- Covers >20,000 molecules from 2,650 firms.
- Authors match firms to headquarter countries to get origin-destination sales flow.

Demand Shifter Data

- **WHO Global Burden of Disease (GBD):** Disease incidence by demographic group (age/gender).
- **U.S. Census Bureau:** Population data for each demographic group in each country.

$\rightarrow$ Together, these are used to construct the **Predicted Disease Burden (PDB)**.

Baseline Results (Table III)

The regression estimates confirm the theory's predictions.

Dependent Variable: Log(Bilateral Sales)

Variable	**Coefficient (Std. Err.)**
Log(PDB, destination) (β_M)	0.545 (0.107)
Log(PDB, origin) (β_x)	**0.928 (0.123)**
Observations	19,150

Test 1: Weak Home-Market Effect ($\beta_x > 0$)

The coefficient on origin PDB is 0.928 and highly significant.
Result: The weak HME is strongly supported.

Test 2: Strong Home-Market Effect ($\beta_x > \beta_M$)

An F-test rejects the null hypothesis that $\beta_x \leq \beta_M$ (p-value = 0.018).
Result: The strong HME is also supported.

These results are robust to dozens of sensitivity checks.

Mechanism: Disentangling Supply & Demand

Is the effect driven by economies of scale (as theory predicts) or something else (e.g., inelastic demand)? The authors use an IV strategy to estimate the structural elasticities.

Demand Elasticity (ε^x)

- Estimated using trade distance and price data.
- Result: $\varepsilon^x \approx 6.2$
- **Conclusion:** Demand is highly elastic. This is *not* driving the result.

Supply Elasticity (ε^s)

- Estimated using PDB as an instrument for total sales.
- Result: $\varepsilon^s \approx -7.8$
- **Conclusion:** The supply curve is strongly **downward-sloping**.

The Verdict

The paper provides direct evidence that the home-market effect is driven by substantial **industry-level economies of scale**.

Conclusion

- This paper provides the most convincing empirical evidence to date in favor of the **home-market effect**.
- Its novel identification strategy, using demographic structure to predict exogenous demand, solves a long-standing challenge in the field.
- The findings confirm the central mechanism of **New Trade Theory**: a large home market fosters economies of scale, which in turn drives export performance.
- In short: **The more we (are predicted to) die at home, the more we sell abroad.**

Critical Analysis & Discussion

This is an outstanding paper, but there are areas for future research.

Generalizability

The findings are from a single, unique industry (pharmaceuticals). Would the effect be as strong in sectors with lower fixed costs or different regulatory structures?

Exports vs. FDI

The sales data combine exports and sales by foreign affiliates. The underlying economies of scale may differ (production vs. R&D). Future work could try to disentangle these channels.

Static Analysis

The cross-sectional design captures the effect at one point in time. A panel analysis, though difficult, could reveal the dynamic evolution of the home-market effect as demographics and industries change.

Motivation: The Home-Market Effect Puzzle

A Core Idea in "New Trade Theory"

The Home-Market Effect (HME), hypothesized by Linder (1961) and formalized by Krugman (1980), posits that countries with large domestic demand for a product tend to become net exporters of it.

A Major Empirical Challenge

Testing this is notoriously difficult due to endogeneity.

- Standard demand proxies (e.g., national expenditure) are equilibrium outcomes.
- A positive supply shock can increase both domestic expenditure and exports, creating a spurious correlation.
- **Key Question:** How can we isolate an exogenous shock to home demand?

This Paper's Contribution: A Novel Identification Strategy

The Core Idea

Use a country's exogenous demographic structure as a predictor for its demand for specific pharmaceuticals.

- This is a spatial analogue to the time-series strategy of Acemoglu & Linn (2004).
- It creates a plausibly exogenous demand shifter: the **Predicted Disease Burden (PDB)**.

The PDB Instrument

For each country i and disease n, the PDB is constructed as:

$$(PDB)_i^n = \sum_{a,g} \left[\text{pop}_{iag} \times \left(\frac{\sum_{k \neq i} \text{burden}_{kag}^n}{\sum_{k \neq i} \text{pop}_{kag}} \right) \right]$$

- pop_{iag}: Population of age-gender group (a, g) in country i.
- The ratio is the average disease burden for group (a, g) in the *rest of*

Sources of Variation for the PDB Instrument

Variation in Demographics Across Countries

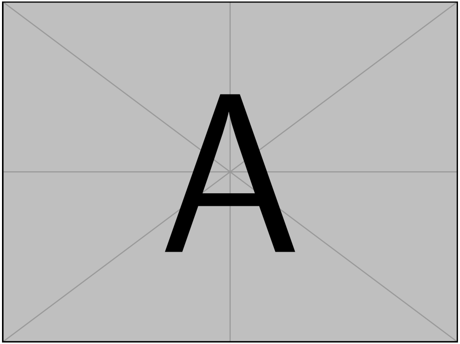

Figure: Share of population under age 60 varies dramatically (e.g., Japan vs. UAE). Based on Figure IV in Costinot et al. (2019).

Variation in Disease Profile Across Demographics

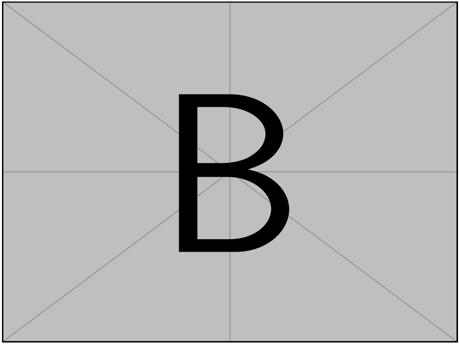

Figure: Share of global disease burden borne by population under 60 varies by disease (e.g., Alzheimer's vs. Whooping Cough). Based on Figure V.

The Theoretical Mechanism: Why Scale Economies are Key

No HME (Neoclassical)

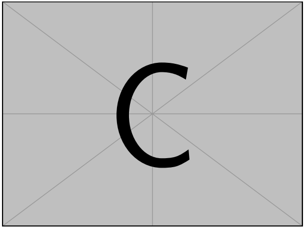

Figure: Higher home demand → Higher Price → Lower Exports. Based on Figure I.

Weak HME

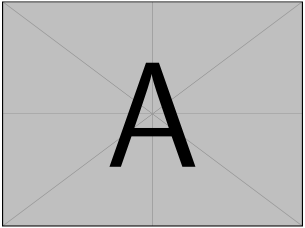

Figure: With scale economies, higher demand → Lower Price → Higher Exports ($\beta_X > 0$). Based on Figure II.

Strong HME

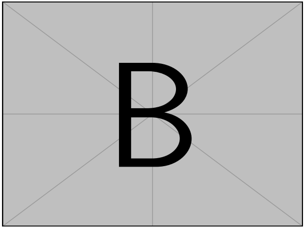

Figure: With strong scale economies, Exports rise more than Imports ($\beta_X > \beta_M$). Based on Figure III.

A home-market effect requires a downward-sloping industry supply curve, i.e., increasing returns to scale.

Empirical Strategy: Baseline Specification

The paper tests the HME by estimating a gravity-style equation:

Equation (16)

$$\ln x_{ij}^n = \delta_{ij} + \delta^n + \tilde{\beta}_M \ln(PDB)_j^n + \tilde{\beta}_X \ln(PDB)_i^n + \tilde{\epsilon}_{ij}^n$$

- x_{ij}^n: Bilateral sales from origin i to destination j for disease n.
- $(PDB)_i^n$: Predicted Disease Burden in the origin (exporter).
- $(PDB)_j^n$: Predicted Disease Burden in the destination (importer).
- δ_{ij}: Origin-Destination fixed effects (absorbs distance, etc.).
- δ^n: Disease fixed effects (absorbs global disease size).

Hypothesis Tests

- **Weak HME**: Test if $\tilde{\beta}_X > 0$.
- **Strong HME**: Test if $\tilde{\beta}_X > \tilde{\beta}_M$.

Main Result: Strong Evidence for HME

Baseline Results (Table III, Column 3)

Variable	**Coefficient (Std. Err.)**
ln(PDB, destination) $(\tilde{\beta}_M)$	0.545
	(0.107)
ln(PDB, origin) $(\tilde{\beta}_X)$	0.928
	(0.123)
Observations	19,150
Adjusted R^2	0.540

Hypothesis Test Results

- **Weak HME ($H_0 : \tilde{\beta}_X \leq 0$):** p-value $= 0.000$. **Resoundingly rejected.**
- **Strong HME ($H_0 : \tilde{\beta}_X \leq \tilde{\beta}_M$):** p-value $= 0.018$. **Rejected at 5% level.**

Conclusion: Countries with higher exogenous demand for a drug export

Robustness of the Main Finding

The main result is robust to a wide array of alternative explanations and specifications.

- **Controlling for Confounders (Table IV):** Results hold after controlling for interactions between disease characteristics and country characteristics like GDP per capita.
- **Supply-Side Stories (Table V):**
  - The effect remains when controlling for US NIH subsidies.
  - The weak HME is present even when looking only at **generic drugs**, where R&D-related scale economies should be weaker.
- **Spatial Correlation of Demand (Table VI):** Results are not driven by demand in neighboring countries.
- **Pricing-to-Market (Table VII):** The weak HME holds within the EU, where parallel trade limits price discrimination.
- **Zero Trade Flows (Table VIII):** Results are robust to using PPML estimation, which includes observations with zero sales.

Structural Results: Quantifying Economies of Scale

The paper goes beyond the reduced-form test to estimate the structural supply elasticity (ϵ^s).

IV Strategy

- **Goal:** Estimate the elasticity of the industry supply curve.
- **Problem:** Total sales (scale) is endogenous to supply shocks.
- **Solution:** Instrument for a country's total sales in a disease category ($\ln r_i^n$) with the exogenous demand shifter ($\ln(PDB)_i^n$).

Key Structural Finding (Table X)

The IV estimation yields a supply elasticity of:

$$\epsilon^s = -7.833$$

- The negative sign provides direct evidence of a **downward-sloping supply curve**, confirming the existence of significant industry-level

Conclusion & Critical Assessment

Summary of Contributions

- Provides a simple, powerful, and credible test of the home-market effect.
- Solves a major identification problem using a novel demographically-driven instrument (PDB).
- Finds strong evidence for both weak and strong HME in the global pharmaceutical industry.
- Quantifies the underlying economies of scale, finding $\epsilon^s = -7.833$.

Points for Discussion & Future Research

- **External Validity:** The pharmaceutical industry is an ideal setting for HME. Would these results generalize to industries with weaker scale economies?
- **FDI vs. Exports:** The data combine exports and sales from local affiliates. Is this a "production HME" or a "headquarters HME" (driven by R&D/marketing)?

Thank You

Questions?