



Estimating the Armington Elasticity: The Importance of Study Design and Publication Bias



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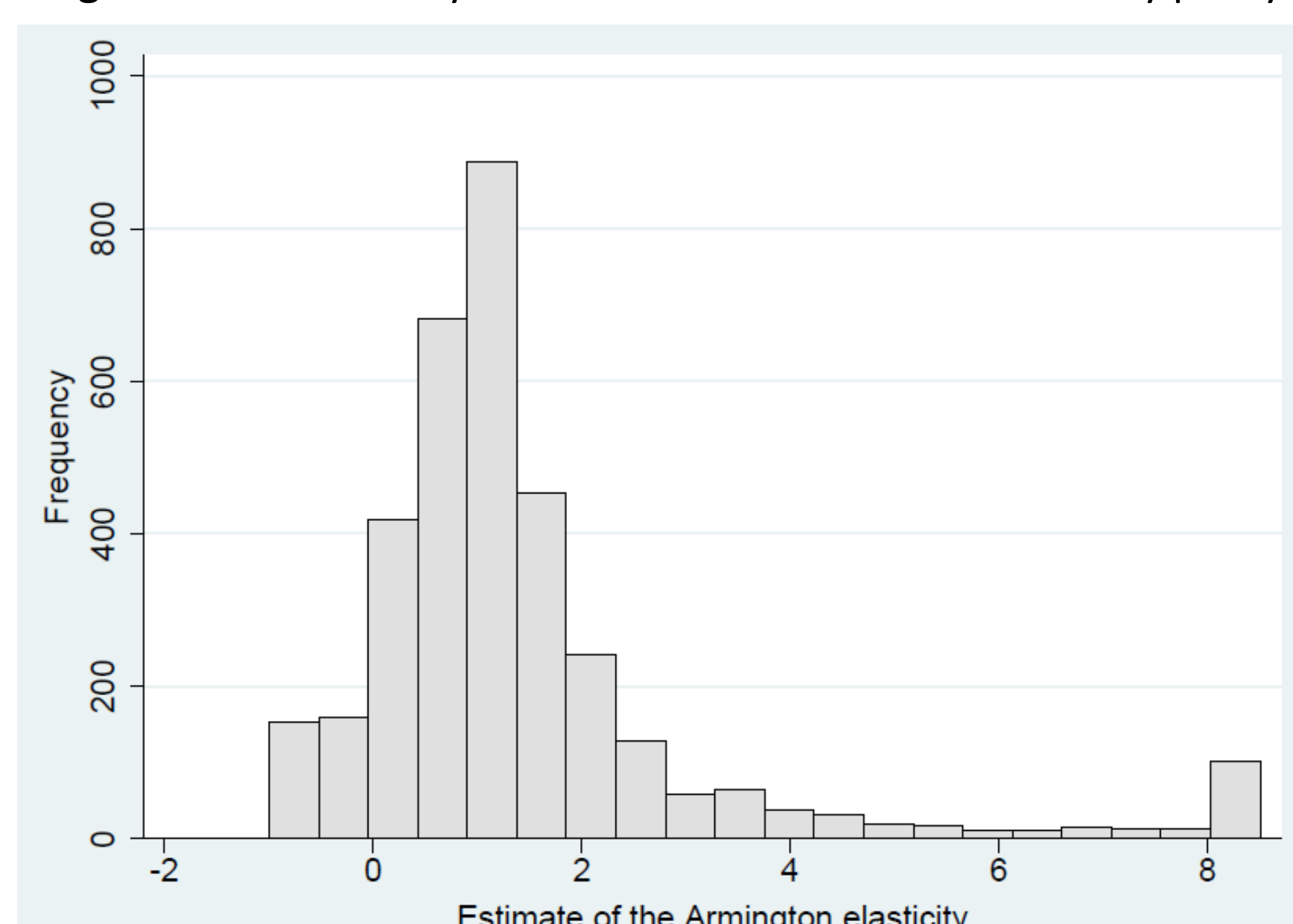
Abstract

A key parameter in international economics is the elasticity of substitution between domestic and foreign goods, also called the Armington elasticity. Yet estimates vary widely. We collect 3,524 reported estimates of the elasticity, construct 32 variables that reflect the context in which researchers obtain their estimates, and examine what drives the heterogeneity in the results. To account for model uncertainty, we employ Bayesian and frequentist model averaging. To correct for publication bias, we use newly developed non-linear techniques. Our main results are threefold. First, there is publication bias against small and statistically insignificant elasticities. Second, differences in results are best explained by differences in data: aggregation, frequency, size, and dimension. Third, **the elasticity implied by the literature after accounting for both publication bias and study quality lies in the range 2.5–5.1 with a median of 3.8.**

Motivation

How does the demand for domestic versus foreign goods react to a change in relative prices? The answer is central to a host of research and policy problems in international trade and macroeconomics: the welfare effects of globalization, trade balance adjustments, and the exchange rate pass-through of monetary policy, to name but a few. Any attempt to evaluate the effect of tariffs in particular depends crucially on the assumed reaction of relative demand to relative prices. In most models, the reaction is governed by the (constant) elasticity of substitution between domestic and foreign goods. As Hillberry & Hummels (2013, p. 1217) put it, “it is no exaggeration to say that [the elasticity] is the most important parameter in modern trade theory.” But the estimates of the elasticities vary substantially. **A researcher wishing to calibrate her policy model can easily find empirical evidence for any value of the elasticity between 0 and 8** (see Figure 1). What is the value of Armington elasticity implied by the empirical literature?

Figure 1. The elasticity of substitution matters for monetary policy



Collecting the Data

We design a search query in Google Scholar and search through studies where researchers specifically regress the ratio of imports to domestic consumption on the ratio of domestic prices to import prices. Such strategy yields the elasticity of substitution between domestic and (combined) foreign varieties. We also need a study to report some measure of uncertainty of its estimates. The final sample consists of 3,524 estimates from 42 papers.

Approximately 10% of the estimates are negative and commonly believed to occur due to misspecifications in the demand function and problems with import prices. More than half of the estimates are larger than unity, which suggests that domestic and foreign goods can often be expected to form gross substitutes. Nevertheless, estimates differ greatly both within and between individual studies and home countries. This bird's-eye view on data suggests there is potential for systematic differences among the reported elasticities, but any particular conclusion can be misleading without accounting for publication bias.

Publication Bias

A conspicuous feature of the Armington elasticity is that it must be positive if both domestic and foreign goods are useful to the consumer. Therefore, the literature has shunned negative and zero estimates as clear artifacts of data or method problems. Indeed, it does make sense for (and improves the value of) any individual study not to focus on estimates that are evidently wrong. But when most authors follow the strategy of ignoring estimates that have the *wrong* sign or are statistically insignificant, our inference from the literature as a whole (and also from many individual studies) becomes distorted. This preference for “correct” results is called publication bias.

The publication bias often presents in form of a correlation between the elasticity and its standard error. This happens either because researchers discard negative estimates of the elasticity or because researchers compensate for large standard errors with large estimates of the elasticity. We run a battery of tests for the pooled set of elasticities, short-run elasticities, and long-run elasticities (Table 1). Even non-linear tests corroborate the findings that **publication bias exaggerates the long-run values almost two-fold.** However, some of the apparent correlations between the estimated elasticities and their standard errors can be due to data and method heterogeneity.

Table 1. All tests indicate publication bias among long-run Armington elasticities

	All	Short-run	Long-run
OLS			
Publication bias	0.808*** (0.0652)	0.0791 (0.0826)	0.805*** (0.0630)
Effect beyond bias	0.873*** (0.133)	0.867*** (0.0249)	0.901*** (0.168)
Weighted average of adequately powered (Ioannidis <i>et al.</i> , 2017)			
Effect beyond bias	1.049*** (0.017)	0.872*** (0.024)	1.101*** (0.021)
Selection model (Andrews & Kasy, 2019)			
Effect beyond bias	0.911*** (0.015)	0.863*** (0.018)	0.943*** (0.021)
Observations	3,524	556	2,968

Why Elasticities Vary

We address the variance in study design by collecting additional 31 explanatory variables which reflect various characteristics of data, home countries, methods, models, and quality of studies estimating the Armington elasticities. We employ Bayesian and frequentist model averaging to account for model uncertainty. Our results suggest that the **larger elasticities reported by more recent studies can be explained by differences in data and methods**; these larger values also tend to appear in higher quality publication outlets.

When we account for both publication bias and study quality, we obtain estimates of the Armington elasticity with a median of 3.8, which in a simple model translates to a **trade cost elasticity of about 2.8.** Table 2 illustrates the results of a similar exercise. We compute mean estimates of the elasticity conditional on the entire literature using the methods of Feenstra *et al.* (2018) and Imbs & Mejean (2015) for selected countries in our dataset.

Table 2. Estimates implied for individual studies

	Feenstra <i>et al.</i> (2018)			Imbs & Mejean (2015)		
	Mean	95% conf. int.		Mean	95% conf. int.	
Australia	3.3	2.0	4.6	3.9	2.3	5.5
Germany	2.9	1.7	4.0	3.5	2.0	4.9
Japan	3.4	2.1	4.6	4.0	2.6	5.3
Russia	3.3	1.5	5.1	3.9	2.0	5.8
United Kingdom	3.1	2.0	4.2	3.7	2.2	5.1
United States	2.5	1.4	3.6	3.1	1.8	4.4
Overall mean	3.1	1.6	4.5	3.7	2.6	4.7

Conclusion

We present the first quantitative synthesis of the empirical literature on the Armington elasticity. We find that publication bias exaggerates the elasticity, while several method problems underestimate the elasticity. Our median estimate is 3.8.

Please visit our website at meta-analysis.cz/armington for data, code, and the full paper. The paper has just been published in the Journal of International Economics.

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