

# Aggregate investment expenditures on tradable and nontradable goods

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## Abstract

This paper shows that aggregate investment expenditure shares on tradable and nontradable goods are very similar in rich and poor countries, as well as in different regions of the world. Furthermore, the two expenditure shares have remained close to constant over time, with the average expenditure share on nontradables varying between 0.54–0.62 over the 1960–2004 period. The results of this paper offer a new restriction for two-sector models of the aggregate economy. Combined with the fact that the relative price of nontradables correlates positively with income and exhibits large differences across space and time, our findings suggest that tradable and nontradable goods in investment can be modeled using the Cobb–Douglas aggregator.

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## 1. Introduction

Models with tradable and nontradable goods are widely used in macroeconomics. When writing down such a model, assumptions about parameter values and functional forms that capture the role of the two goods in consumption and investment are required. While the role of tradables and nontradables in consumption has been extensively researched in economic literature, a systematic examination of the investment side is missing.

This paper aims to fill this gap in the literature. It provides a systematic empirical examination of the role played by tradables and nontradables in aggregate investment. We find that on average around 60 percent of aggregate investment expenditures are spent on nontradables. Aggregate investment expenditure shares on tradable and nontradable goods show no correlation with income and are very similar in different regions of the world, such as Africa, South-East Asia, Europe or Latin America. Furthermore, the two expenditure shares have remained close to constant over time, with the average expenditure share on nontradables varying between 0.54–0.62 over the 1960–2004 period. At the same time, between some sample countries expenditure shares do exhibit sizable differences.

One of the most consistent related empirical findings in the macroeconomic literature is that the relative price of nontradable goods in terms of tradable goods exhibits a strong positive correlation with income in cross section as

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well as time-series data.<sup>1</sup> As we show, price data for tradable and nontradable goods in investment offer no exception to this empirical regularity. Combined with the large variation in relative prices, our results suggest that at the level of aggregate economy investment process can be modeled using a unitary elasticity of substitution between tradable and nontradable goods, i.e., the Cobb–Douglas case, and a county-specific investment share parameter. We also show that if residential structures are excluded from investment data the weight of nontradables decreases to 46 percent of aggregate investment, but none of paper's other findings are significantly altered.

The results of this paper are applicable not only to small open economy models with tradable and nontradable goods, but also to closed economy models differentiating between equipment (or durable goods) and structures (or plants) in investment. This is the case since, as shown in the paper, 80–90 percent of the aggregate investment expenditures are spent on acquiring output from only two sectors of economic activity—equipment from the manufacturing sector and structures from the construction sector. The former is a tradable good and the latter a nontradable good.

A frequent practice in the modeling literature has been to assume that only tradables or nontradables can be transformed into investment goods, or that the role of tradables and nontradables in investment is the same as in consumption.<sup>2</sup> Not surprisingly, our empirical results offer no support for such assumptions and, more importantly, allow to evaluate their appropriateness. There are also models in the literature that use detailed investment expenditure data to pin down country-specific investment expenditure shares and, out of functional appeal, have assumed that such expenditure shares remain constant.<sup>3</sup> For such models our paper provides supporting empirical evidence.

To our knowledge, no previous research has extensively examined the questions addressed in this paper. DeLong and Summers (1991) and, more recently, Burstein et al. (2004) point out that investments have a very significant nontradable component. Drawing on evidence from 19 observations for medium and high income countries, Burstein et al. (2004) report a strong negative correlation ( $-0.69$ ) between investment expenditure share on the output of construction sector and real per capita income. The considerably larger data set of our paper does not support this finding. For the particular country-year observations, used by Burstein et al. (2004), our data also exhibit a negative correlation. However, when the whole dataset is considered, the correlation is close to zero.

We argue that empirical findings of this paper are compatible with other related findings in the literature, such as

- (i) no correlation between investment rates, measured in domestic prices, and income,
- (ii) positive correlation between equipment intensity in investment and income, and
- (iii) less than unitary elasticity of substitution between tradables and nontradables in consumption.

Paper also spells out restrictions for functional forms and parameter values that need to be imposed for a model to comply with our empirical findings. Distinction is made between models that assume an aggregate capital stock and models that differentiate between capital stocks composed of tradables and nontradables.

The last section demonstrates that our findings can make a difference when models are used to explain data. Using a two-sector growth model, we investigate if low investment rates in poor countries, when measured in common international prices, can be explained with productivity differences between sectors producing tradables and nontradables. The model fares well, when standard assumptions in the literature are used, i.e., investment is mostly tradable and consumption nontradable. However, when we restrict the model's functional forms and parameters to comply with our empirical results, productivity differences can at best explain a small fraction of variation in investment rates. This is the case, since, like consumption, investment expenditures are mostly nontradable.

The structure of the rest of the paper is as follows. Section 2 is devoted to documenting the structure of investment expenditures. We examine how much of the aggregate investment expenditures are spent on the output of different sectors of economic activity. This section also presents data sources and discusses several data related issues. Section 3 presents empirical findings about investment expenditures on nontradables in both time-series and cross section data.

<sup>1</sup> See, e.g., Balassa (1964), Samuelson (1964), Kravis et al. (1982) and De Gregorio et al. (1994).

<sup>2</sup> For examples of models with only tradables in investment see Rebelo and Vegh (1995), Obstfeld and Rogoff (1996), Mendoza and Uribe (2000), Uribe (2002). For a model with only nontradables in investment see van Wincoop (1993). For a model where the role of tradables and nontradables in investment is assumed to be the same as in consumption see Laxton and Pesenti (2003). For the later case we argue that it is, in fact, easier to determine the role of the two goods in investments than in consumption.

<sup>3</sup> See, e.g., Fernandez de Cordoba and Kehoe (2000) and Kehoe and Ruhl (2006) for open economy models, and Greenwood et al. (1997) for a closed economy model.



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