Investment Prices and Exchange Rates: Some Basic Facts

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Abstract

This paper documents four basic facts about investment goods and investment prices. First, investment has a very significant nontradable component in the form of construction services. Second, distributions services (wholesaling, retailing, and transportation) are much less important for investment than for consumption. Third, the import content of investment is much larger than that of consumption. Finally, in the aftermath of three large devaluations, the rate of exchange rate pass-through is, perhaps not surprisingly, highest for imported equipment and lowest for construction services.

There is a large literature that studies the importance of tradable goods in consumption and the comovement between consumer prices and exchange rates. In contrast, there is a paucity of work on the characteristics of investment goods and the comovement of their prices with exchange rates. This paper summarizes four basic facts about investment goods and investment prices. First, nontradable goods and services have a very significant weight in investment expenditure, with construction services being the most important nontradable component. The weight of nontradables is, nevertheless, lower in investment than in consumption spending. Second, distribution services (wholesaling, retailing, and transportation) are much less important for investment goods than for consumer goods. Third, the fraction of goods that is imported is much larger for investment than for consumption. Finally, in the three large devaluation episodes for which we obtained investment prices (Mexico (1994), Korea (1997), and Argentina (2001)), construction prices respond by much less to movements in the exchange rate than the prices of equipment respond.

These facts have clear implications for theoretical work on open economy models. In particular, the standard assumption that investment goods are tradable is clearly at odds with the data. Modeling investment as requiring local construction services may be a better approach to generating plausible investment dynamics in open economy models than the standard investment adjustment costs formulation.[1] The composition of investment is also important for models that emphasize the role of collateral constraints.[2] Finally, modeling the nontradable component of investment is likely to be important in understanding the behavior of investment in the aftermath of large devaluations.

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[1] See Aghion, Bacchetta, and Banerjee (2003) for a model where the presence of a local production input, which can be interpreted as construction services, plays an important role.

[2] See, for example, Caballero and Krishnamurthy (2001) and Christiano, Gust, and Roldos (2003).

The Importance of Construction Services in Investment Expenditure

Before discussing the role of nontradables in investment, it is useful to review the basic facts about the composition of consumption. The direct weight of nontradable services in the typical consumer price index (CPI) basket is roughly 50 percent.[3] The total weight is, however, closer to 75 percent, because the tradable goods that enter the CPI basket are purchased in retail stores and thus embody an important component of distribution services (retailing, wholesaling, and transportation), which are clearly nontradable. According to the estimates in Burstein, Neves, and Rebelo (2003), the distribution margin (the fraction of the retail price that represents distribution services) is roughly 50 percent. This means that distribution services account for 25 percent of the CPI basket, bringing the total weight of nontradable goods to 75 percent.[4]

The evidence summarized in Table 1 shows that the nontradable component of investment is also significant but not as large as that of consumption. Our data set includes input-output tables for 19 countries. The tables for 15 of these countries were compiled by the OECD. We supplemented the OECD data set with input-output tables for Korea, Mexico, Chile, and Argentina. We used these input-output tables to compute the fraction of final investment that is supplied directly by the construction sector. Table 1 shows that this fraction ranges from a low of 35 percent for Norway to a high of 67 percent in Brazil. For the average of the 19 countries in our sample, 51 percent of investment is supplied by the construction sector. This suggests that roughly half of investment spending is comprised of nontradable goods and services.

One caveat to this conclusion is that the construction sector is a heavy user

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[3] See Burstein, Eichenbaum, and Rebelo (2003).

[4] Burstein, Eichenbaum, and Rebelo (2003) argue that, out of the remaining 25 percent of pure tradables, a significant fraction is represented by local goods. These local goods are produced for the domestic market and their prices tend to behave like those of nontradable goods.

of materials, some of which are tradable. Table 1 shows that total intermediate inputs represent on average 57 percent of the gross output of the construction sector. This table also reports the fraction of tradable intermediate inputs in construction gross output.[5] For the average country in our sample, this fraction is 32 percent. We view this estimate as an upper bound, since many of the materials classified as tradable are likely to have large transportation costs and hence a low degree of tradability.

We conclude that the fraction of nontradable goods in investment for the average country in our sample ranges between 51 percent (if we assume that all of construction's intermediate inputs are nontradable) and 35 percent (if we assume that 32 percent of the inputs are tradable).

Figure 1 shows that there is a clear negative relation between the weight of construction services in investment expenditures and the country's level of development, as measured by the per capita GDP in constant U.S. dollars constructed by Heston, Summers, and Aten (2002). The correlation between the two variables is -0.69. This evidence suggests that, as countries develop, there seems to be a decline in the importance of construction in investment.[6]

The input-output tables compiled by the OECD do not disaggregate investment into residential and non-residential investment. To study the importance of nontradables in nonresidential investment, we use the U.S. input-output tables for 1992 and 1997 prepared by the Bureau of Economic Analysis.[7] Table 2 shows that, in 1997, construction services represented 24 percent of nonresidential in-

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[5]The sectors classified as tradable were sectors 1 through 24 in the OECD input-output tables.

[6]Time series data for the U.S. on the share of residential and structure investment in total investment for the period 1978-2001, also show a significant downward trend.

[7]The U.S. 1997 input-output tables published by the Bureau of Economic Analysis and the OECD do not coincide. This accounts for the different estimates of the U.S. ratio of construction expenditures to total investment in Tables 1 and 2.

vestment, while total nontradable services represented 41 percent of nonresidential investment.[8]

The Importance of Distribution Services for Investment Goods Table 1 provides estimates of the distribution margin associated with tradable investment goods based on our input-output data. The distribution margin is defined as: (retail price-producers price)/(retail price).[9] This margin reflects the cost of providing distribution services (wholesaling, retailing, and transportation) as well as any markups in the distribution sector. The distribution margin for tradable investment goods ranges from 7 percent in Spain to 29 percent in Mexico. The average distribution margin in our sample is 17 percent. This margin is significant, but still much lower than the margins for consumption goods reported by Burstein, Neves, and Rebelo (2003), which range from 35 percent in France to 60 percent in Argentina.

The Import Content of Investment Table 1 also includes information, extracted from Burstein, Eichenbaum, and Rebelo (2003), on both the direct and the total import content of investment. The direct import content is the fraction of final imported goods in total investment exclusive of distribution services. The total import content is the direct import content plus the value of imported intermediate inputs used to produce final investment goods as a fraction of total investment expenditures. The average direct (total) import content of investment is 17 (30) percent. The average import content of consumption reported by Burstein, Eichenbaum, and Rebelo (2003) is much lower: the direct (total) import

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[8]This computation was based on the assumption that all residential investment is produced in the construction sector.

[9]In practice, this margin was computed as the fraction of wholesale trade, retail trade, and transportation in *tradable* investment. Recall that tradable investment represents roughly 50 percent of total investment, with the remainder representing construction services.

content is 10 (19) percent. The large import content of investment is consistent with Eaton and Kortum's (2001) finding that the traded component of capital goods and equipment is higher than that of manufactured goods as a whole.

Investment Prices in the Aftermath of Three Large Devaluations

Burstein, Eichenbaum, and Rebelo (2002) study the behavior of consumer prices in the aftermath of nine large devaluations. They document that the pass-through from exchange rates to prices is high for prices of tradable goods at the dock, moderate for the retail price of tradable goods, and low for the price of non-tradable services.

Table 3 provides some evidence on the behavior of investment prices for three large devaluation episodes for which we obtained data on investment prices: Mexico (1994), Korea (1997), and Argentina (2001). These data suggest that investment price response patterns are similar to those of consumer prices: goods and services with a higher nontradable component tend to respond less to exchange rate movements. In all three countries, the price of equipment moves by more than the price of construction services.

In Korea, which is the only country for which we have domestic and imported equipment prices, the pass-through from exchange rate to prices is higher for imported equipment than for domestic equipment. One year after the Korean 1997 devaluation, the Won-U.S. Dollar exchange rate had depreciated by 41 percent. Investment prices increased by only 4 percent but there is substantial heterogeneity within investment subcategories. Imported equipment prices increased by 42 percent, while domestic equipment prices increased by 8 percent. Construction prices increased by only 1 percent.

Mexico and Argentina disaggregate the price of construction into labor costs and materials prices. In both cases, materials prices move by more than labor

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costs. For example, one year after the Mexican devaluation, material prices increased by 40 percent, while labor costs increased by 27 percent. The analogous numbers for the Argentina devaluation are 55 percent and 10 percent.

We conclude that the pass-through from exchange rates to prices is much lower for the nontradable component of investment than for the tradable component. This means that modeling the nontradable component of investment is likely to be important in understanding investment dynamics in the aftermath of large devaluations.

References

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[7] Heston, Alan, Robert Summers, and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

Table 1: Construction, Distribution Costs, and Import Content of Investment

	Korea 1993	Mexico 1990	Brazil 1999	Argentina 1997
Construction Expenditures/Investment Expenditures	54.0	48.5	67.4	54.2
(Construction + Other Nontradables)/ Investment*	60.1	63.5	n.a.	63.8
(Intermediate Inputs/Gross Output) in Construction	57.0	50.3	n.a.	50.3
(Tradable Intermediate Inputs/Gross Output) in Construction	39.4	35.9	n.a.	36.0
Distribution Margin for Tradable Investment Goods	8.2	29.2	n.a.	16.7
Direct Import Content of Investment	12.4	15.9	n.a.	14.7
Total Import Content of Investment	27.5	26.2	n.a.	22.6

	Australia 1995	Canada 1990	Chile 1996	Denmark 1998
Construction Expenditures/Investment Expenditures	50	52.6	59.6	45.7
(Construction + Other Nontradables)/ Investment*	62.7	59.6	67.7	58.7
(Intermediate Inputs/Gross Output) in Construction	55.8	55.4	46.6	67.1
(Tradable Intermediate Inputs/Gross Output) in Construction	35.8	32.5	41.5	34.1
Distribution Margin for Tradable Investment Goods	26.9	15.1	n.a.	26.6
Direct Import Content of Investment	15.5	22.6	35.5	18.7
Total Import Content of Investment	26.6	35.2	46.3	34.8

	Finland 1995	France 1995	Germany 1995	Greece 1996
Construction Expenditures/Investment Expenditures	45.8	48.5	49.4	64.7
(Construction + Other Nontradables)/ Investment*	56.4	56.2	54.6	71.1
(Intermediate Inputs/Gross Output) in Construction	59.5	59.3	54.8	50.8
(Tradable Intermediate Inputs/Gross Output) in Construction	35.1	24.8	31.2	38
Distribution Margin for Tradable Investment Goods	13.5	10.1	10.3	17.7
Direct Import Content of Investment	16.7	11.7	11.1	21.3
Total Import Content of Investment	34.2	32.9	18.5	36.6

	Italy 1992	Japan 1995	Netherlands 1996	Norway 1997
Construction Expenditures/Investment Expenditures	49.8	57.3	43.2	34.6
(Construction + Other Nontradables)/ Investment*	58.6	65.3	53.2	45.8
(Intermediate Inputs/Gross Output) in Construction	57.7	55.2	66.5	66.9
(Tradable Intermediate Inputs/Gross Output) in Construction	31.5	31.8	26.1	31.4
Distribution Margin for Tradable Investment Goods	16.0	22.2	19.2	17.5
Direct Import Content of Investment	10.2	2.6	21.4	29.5
Total Import Content of Investment	21.8	8.3	40.5	45.6

	Spain 1995	UK 1998	US 1997	Average
Construction Expenditures/Investment Expenditures	56.4	41.0	42.3	50.8
(Construction + Other Nontradables)/ Investment*	63.8	48.1	52.7	59.0
(Intermediate Inputs/Gross Output) in Construction	61.9	63.6	53.0	57.3
(Tradable Intermediate Inputs/Gross Output) in Construction	28.7	19.0	31.0	32.4
Distribution Margin for Tradable Investment Goods	7.2	11.1	16.7	16.7
Direct Import Content of Investment	13.5	24.0	10.4	17.1
Total Import Content of Investment	26.2	35.1	18.4	29.9

* Other Nontradables are Distribution and Real Estate Services.
Data Source: National Statistical Agencies and OECD

Table 2: Construction, Residential, and Non-Residential Investment

	1992	1997
Percentage of Total Investment Expenditures		
Residential and Nonresidential Construction	45.5	38.4
Residential and Nonresidential Construction + Other Nontradables	54.3	52.1
Nonresidential Construction	24.1	19.1
Nonresidential Construction + Other Nontradables	32.8	32.8
Percentage of Nonresidential Investment		
Nonresidential Construction	30.7	23.6
Nonresidential Construction + Other Nontradables	41.8	40.7

* Other Nontradables are Distribution and Real Estate Services.
Data Source: US Bureau of Economic Analysis Input-Output Tables

Table 3: Investment Prices and Exchange Rates After Large Devaluations
Cumulative Logarithmic Rates of Change

	Mexico - December 1994				Korea - September 1997				Argentina - January 2001			
	3 months	6 months	12 months	24 months	3 months	6 months	12 months	24 months	3 months	6 months	12 months	15 months
US$ Nominal Exchange Rate	50.2	54.9	80.0	83.3	49.0	49.3	41.2	27.6	86.0	129.2	125.5	112.7
Trade-weighted Nominal Exchange Rate	50.5	56.0	80.2	82.8	46.0	46.1	37.9	31.3	85.2	128.9	118.3	108.7
Consumer Price Index	8.7	26.2	39.5	64.0	2.6	6.5	6.6	7.4	9.3	26.7	34.4	36.8
Investment Price Index	16.4	33.5	44.4	68.3	4.8 (*)	9.7 (*)	3.7 (*)	2.0 (*)				
Equipment	25.2	44.2	55.5	73.0	4.4	21.5	19.2	14.3				
Domestic					0.3	5.2	8.1	5.6	26.5	59.2	63.3	61.8
Imported					13.5	52.1	41.5	32.2				
Construction	14.0	29.2	37.6	60.2	2.1 (*)	2.8 (*)	1.2 (*)	1.8 (*)	12.3	25.8	34.5	36.0
Materials	15.5	31.5	39.9	61.5					23.8	46.4	55.4	55.1
Labor	7.3	18.7	27.3	54.6					0.3	1.5	9.8	13.2

(*) Deflator based on National Income Account Statistics

Data Source: National Statistical Agencies

Figure 1
Percentage of Construction Services in Investment Expenditure