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The price of imports and TFP: Application to the Korean crisis of 1997–1998

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ABSTRACT

This paper studies the effects of import-price shocks on measured output and productivity in a standard small open economy model and quantifies such effects in the case of the Korean crisis of 1997–1998. I argue that it is the price of imported goods relative to the price of domestic goods but not the terms of trade that determine measured output and productivity. The simulated results show that shocks to the price of imports account for about half of the output deviation (from trend), one third of the TFP deviation and two thirds of the labor deviation in 1998. For the quantitative results, the extent to which the usage of imported goods is distorted is critical and substantially larger than tariffs because of significantly sizable non-tariff distortions.

1. Introduction

During the Korean crisis of 1997–1998, Korea's output dropped substantially: it was 7.7% below trend in 1998. In this period, Korea's labor and TFP were also substantially low: below trend by about 6.7% and 5.7%, respectively, while capital was *above* trend. At the same time, Korea also experienced sharp increases in the price of imports, about 14.2% above trend. This paper studies the effects of changes in the import price on output, labor and TFP and quantifies such effects in the case of the Korean crisis of 1997–1998.

The model is a small open economy where final good production uses both domestic and imported intermediate goods. The domestic intermediate good is produced with capital and labor. The imported good has an exogenous price, which follows a stochastic process. The gross price of the imported good paid by domestic buyers is, however, higher than the at-the-dock price of the imported good due to distortions such as taxes, tariffs, etc. I label such distortions as an *import-price wedge*. Because of this wedge, the marginal product of the imported good differs from its marginal cost, resulting in measured total factor productivity (TFP) being lower than it would otherwise be.

In the model, an increase in the import price results in the substitution of the domestic intermediate good for the imported good. This import substitution in turn has negative effects on measured output via two channels: labor reduction

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and a drop in measured productivity.[2] First, the import substitution implies a downward shift of the marginal product of labor, resulting in drops in the wage rate and contractions of labor and output. Second, with the import-price wedge, the import substitution itself shows up as a drop in TFP, even though the reduced at-the-dock cost of the imported good tends to alleviate such a drop in TFP. The decline in TFP dwarfs measured output even further.

The model is calibrated to the Korean data during the period 1994–2002. In particular, the import-price wedge is calibrated to the data on tariffs as well as non-tariff distortions, such as taxes and customs clearance fees. I find that both tariffs and non-tariff distortions are sizable; tariffs are about \$0.11 and non-tariff distortions are about \$0.18 for every \$1 of imported goods.

The simulated results show that the import-price shocks account for about half of the output deviation (from trend), one third of the TFP deviation, and two thirds of the labor deviation in 1998. The import-price shocks also account for about two thirds of the 5.2% drop in the real wage rate in 1998.

This paper makes two contributions. First, I put forward the point that it is the import-price shocks rather than the terms-of-trade shocks that matter for fluctuations in TFP and output in a small open economy. Many papers in the literature have considered, as a channel for the impact of imports on TFP and output, the parsimonious case in which both imported and domestic intermediate goods are used as inputs in the production of the final good and focused mainly on the terms-of-trade shocks as a source of the output fluctuations (see, e.g., Kehoe and Ruhl, 2008 and references therein). The key is that in my model, measured output and TFP are given as functions of the relative quantity of the imported to the domestic intermediate good, which is, in equilibrium, monotonic to the relative price of the imported to the domestic intermediate good. For many recent episodes of large devaluations, the imports-to-GDP ratio, a proxy for the relative quantity of the imported to the domestic intermediate good, indeed drops substantially with the spike in the (relative) price of imports, even though the terms of trade are almost constant; see, e.g., Burstein et al. (2005).

Second, I quantify the import-price wedge by calibrating both the tariff and non-tariff distortions to the data. The literature has mainly focused on the tariff distortion. I find that the non-tariff distortion is quantitatively as important as the tariff distortion.

This paper is related to the literature studying large drops in output. Otsu (2008) applies the business cycle accounting framework of Chari et al. (2007) to the Korean crisis and finds that TFP shocks can account for most of Korea's output drop in 1998. Lama (2011) also finds that changes in TFP are important in explaining recent episodes of output drops in Latin America. This paper shows that shocks to the price of imports are an important source of the TFP fluctuations in the Korean crisis episode, which could potentially account for the large drops in TFP of other episodes.

This paper is also linked to the literature that studies the causes and consequences of the Korean crisis of 1997–1998, for example, Benjamin and Meza (2009), Gertler et al. (2007) and Otsu (2008). This paper differs from those papers in shocks and propagation mechanisms. While those papers focus on how financial shocks impact output through the channel of financial frictions, I focus on the consequences of import-price shocks to output in the presence of import distortions.

This paper is organized as follows. Section 2 sets up the model and derives analytic results, and Section 3 calibrates the model and discusses the simulation results. Section 4 concludes.

2. Model

This section lays out an environment of a small open economy in which final good production uses both domestic and imported intermediate goods. Importantly, there is a tax levied on the imported good, which distorts the usage of the imported good. I show analytically that with distortions in the usage of the imported good, an increase in the (relative) import price leads to a decrease in TFP via the substitution of the domestic intermediate good for the imported good.

2.1. Environment

2.1.1. Technology

There are four goods: an imported good, a domestic intermediate good, a (domestic) final good, and an exported good. Domestic intermediate goods and imported goods are used as intermediate inputs in the production of the final good, which is consumed, invested, or used as an intermediate input in the production of the exported good.

The production function of the final good is given by:

$$Y_t = F(M_t, D_t), \quad D_t = K_t^{\theta}[A_t h_t]^{1-\theta}, \; \theta \in (0,1) \tag{1}$$

where Y_t is the final good output, M_t is the imported good, and D_t denotes the domestic intermediate good, which is a Cobb–Douglas composite good of labor h_t and capital services K_t. And $A_t = (1+\gamma)^t$ refers to the labor-augmenting technology growing at the constant rate of $\gamma > 0$. The function $F(M_t, D_t)$ satisfies standard properties.[3]

[2] The mechanism here is similar to that in Kehoe and Ruhl (2008). This model has, however, capital accumulation.

[3] $F(M, D)$ is homogeneous of degree one, twice continuously differentiable, and concave, and it satisfies the decreasing marginal product of $M > 0$ and $D > 0$, respectively, and the Inada conditions hold: $F(\lambda \cdot M, \lambda \cdot D) = \lambda \cdot F(M, D)$, $\forall \lambda > 0$, $F_{11}(M, \cdot) < 0, F_{22}(\cdot, D) < 0$, $\lim_{M\to 0} F_1(M, \cdot) = \infty$, $\lim_{M\to\infty} F_1(M, \cdot) = 0, \lim_{D\to 0} F_2(\cdot, D) = \infty, \lim_{D\to\infty} F_2(\cdot, D) = 0$ where $F_1(M, \cdot) \equiv \partial F(M, \cdot)/\partial M > 0$, $\forall M > 0$, $F_2(\cdot, D) \equiv \partial F(\cdot, D)/\partial D > 0$, $\forall D > 0$, $F_{11}(M, \cdot) \equiv \partial^2 F(M, \cdot)/\partial M^2$, and $F_{22}(\cdot, D) \equiv \partial^2 F(\cdot, D)/\partial D^2$.