Economic Modelling xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.elsevier.com/locate/econmod

Capital mobility in OECD countries: A multi-level factor approach to saving–investment correlations☆

Sun Ho Hwang, Yun Jung Kim*

Sogang University, Republic of Korea

ARTICLE INFO

JEL:
C23
F32
F41

Keywords:
Capital mobility
Saving–investment correlations
Multi-level factor models

ABSTRACT

While a high saving–investment correlation is one of the most robust empirical regularities in international economics, there has been debate about whether it can be interpreted as evidence of barriers to international capital flows. A high saving–investment association may be observed even in perfectly integrated international financial markets if saving and investment are shifted in the same direction due to a common third factor. Instead of focusing on specific common sources, we estimate factors that are (i) common across all countries and (ii) common within each country, using a multi-level factor model proposed by Choi et al. (2017). By controlling for multi-level factors in the saving–investment regression, we effectively isolate the impact of exogenously increased saving on investment regardless of the nature of common sources. We show that the global and country-specific factors together account for almost 50% of the saving–investment correlation in a panel of 19 OECD countries for 1961–2005, and capital mobility has increased over time particularly in Europe. Our analysis provides a measure of capital mobility which helps assess the effectiveness of policies or incidence of taxes in an open economy.

1. Introduction

If capital is perfectly mobile across countries, a country's saving and investment should not be correlated because domestic saving would be invested in its most productive use across the globe, and domestic investment can be financed from the international capital market. By contrast, zero capital mobility implies a one-to-one relation between saving and investment because saving has to be invested domestically. Feldstein and Horioka (1980) found a high correlation between saving and investment in their time-aggregated cross-sectional regression for OECD countries and interpreted it as indicating a low degree of capital mobility. While a number of researchers have confirmed the same empirical finding using different techniques and data, there has been debate about whether it can be interpreted as evidence of barriers to international capital flows.[1] A high observed correlation between saving and investment is not necessarily inconsistent with a high degree of capital mobility if common sources drive saving and investment in the same direction.

The theoretical literature has shown that, regardless of capital mobility, a high saving–investment correlation can be found in the presence of macroeconomic shocks (Tesar, 1993; Decressin and Disyatat, 2008; Bussière et al., 2010), population growth (Obstfeld, 1986), long-run solvency constraints (Coakley et al., 1996; Summers, 1988; Taylor, 2002), current account targeting (Artis and Bayoumi, 1992), financial frictions (Bai and Zhang, 2010) long-run risks (Chang and Smith, 2014), or a large-country effect (Murphy, 1984; Baxter and Crucini, 1993). The empirical literature has been attempting to capture these determinants of saving and investment by employing various econometric techniques. Sinha (2002); Sinha and Sinha (2004); Narayan and Narayan (2010), and Ma and Li (2016) use cointegration analyses to capture the long-run relation between saving and investment. Ho (2000), Özmen and Parmaksız (2003), Mastroyiannis (2007), Telatar et al. (2007), Ketenci (2012), and Chen and Shen (2015) adopt models with structural breaks or regime shifts; Fouquau et al. (2008) employ a panel smooth transition regression model; and Herwartz and Xu (2010) use the function coefficient model. A number of empirical papers have also tried to control for common sources that affect saving and investment simultaneously; examples include Taylor (1994), Glick and Rogoff (1995), Kim (2001), Ventura (2003), Ho and Huang (2006), Decressin and Disyatat (2008), and Bussière et al. (2010). They control

☆ We thank an anonymous referee and the editor for their helpful comments. We are also grateful to seminar participants at Sogang University, Korea University, Bank of Korea, 2016 Korea's Allied Economic Associations Annual Meeting, and 2016 Korean Econometric Society Meeting for their comments and suggestions.

* Correspondence to: Department of Economics, Sogang University, 35 Baekbeom-ro, Mapo-gu, Seoul 04107, Republic of Korea.
E-mail addresses: sunho3137@sogang.ac.kr (S.H. Hwang), yunjungk@sogang.ac.kr (Y.J. Kim).

[1] See Murphy (1984), Dooley et al. (1987), Feldstein and Bachetta (1991), Tesar (1991), and Obstfeld (1995) for cross-sectional estimations, Obstfeld (1986), Bayoumi (1990), Tesar (1993), and Coakley et al. (1996) for time-series estimations, and Kim (2001), Corbin (2001), and Holmes and Otero (2014) for panel estimations.

http://dx.doi.org/10.1016/j.econmod.2017.09.016
Received 16 May 2017; Received in revised form 18 August 2017; Accepted 18 September 2017

for specific shocks or variables that are known to affect saving and investment.

However, it would be nearly impossible to identify and control for all the common sources that might potentially affect the saving–investment relation. We do not focus on specific shocks or variables. Instead, we make a fairly general yet realistic assumption about the common sources. Namely, these common shocks can either affect all countries or be specific to each country. In other words, the common sources can be decomposed into components that are (i) common across all countries' saving and investment (global factors) and (ii) common across saving and investment within each country (country-specific factors). Then, we estimate these multi-level factors using a recently developed methodology. Whatever the nature of the common sources affecting saving and investment might be, we are able to control for them as long as they are multi-layered. By controlling for multi-level factors, we separate out exogenous increases in saving from endogenous increases driven by common factors that also affect investment. That will reveal the proportion of the exogenously increased saving that is retained within the home country and invested domestically, which reflects the degree of capital mobility.

We use Choi et al. (2017) multi-level factor model that allows us to separately estimate global and country-specific factors from a large panel of macroeconomic series in OECD countries. We then explicitly control for the estimated global and country-specific factors to get an unbiased estimate of the saving-retention coefficient. The results indicate that the multi-level common factors indeed help explain the high saving–investment correlation. The global and country-specific factors together account for almost 50% of the saving–investment correlation in a panel of 19 OECD countries for 1961–2005. The levels of the saving-retention coefficient after controlling for the multi-level factors are lower in the European countries than in the non-European countries. The coefficient declines substantially after 1990 in the European countries, while the decline is much smaller in the subsample of the non-European OECD countries. This implies that capital mobility is greater across the European countries and the speed of financial integration after 1990 was faster in those countries compared to the non-European OECD countries.

There have been attempts to control for global shocks and country-specific shocks separately. For example, Glick and Rogoff (1995) control for both global and country-specific shocks for an investment–current account correlation, while Kim (2001) does so for a saving–investment correlation. They use averages of country-level output or total factor productivity as a proxy for global shocks. However, a large idiosyncratic shock that affects only one country can be falsely measured as a global shock if one uses a cross-country average as a measure of the global shock. Our estimates of global and country-specific factors are independent of each other. In addition, Glick and Rogoff (1995) and Kim (2001) do not allow for asymmetric impacts of global and country-specific shocks across countries. However, the effects of global factors can vary across countries, and there is no reason why a country should respond to its own country-specific shocks in the same way as other countries do. While Giannone and Lenza (2010) allow for heterogeneous effects of common factors on saving and investment, they control only for principal component estimates of global factors, and thus their results are still vulnerable to omitted variable bias.

We do not claim that the saving–investment correlation is the best measure of capital mobility. There are other tests of capital mobility such as price-based tests which focus on various parity conditions. However, as one of the widely used quantity-based measures, the saving–investment correlation can be reasonably expected to yield useful information about capital mobility if it is estimated accurately which is what we attempt to do herein.[2] This paper also has policy and practical implications because capital mobility is important in assessing the effectiveness of policies and the incidence of taxes in an open economy, as well as the efficiency of international saving and investment allocations.

The remainder of the paper is organized as follows. In Section 2, we discuss econometric issues related to estimating the saving-retention coefficient, explain our empirical model, and outline the data used for estimation. We present the empirical results in Section 3 and conclude in Section 4.

2. Econometric framework and data

2.1. Econometric framework

If capital is perfectly mobile across countries, a country's saving would be invested anywhere in the world. In a closed economy, by contrast, domestic saving has to be invested domestically. Therefore, measuring the proportion of incremental savings that remains within the home country to be invested domestically would reveal the degree of capital mobility. In order to derive an informative measure of capital mobility, the increment in saving has to be exogenous in the sense that it should not be affected by common causes that also affect investment. That is, the estimation equation should be in the form:

$$I_{it} = \alpha + \beta S_{it}^{exo} + \varepsilon_{it}, \tag{1}$$

where I_{it} is investment of country i at time t, and S_{it}^{exo} refers to exogenous changes in national saving, which are uncorrelated with ε_{it}. The estimate of β in the regression Eq. (1) intends to measure how much exogenously increased saving is retained within the country of origin and is referred to as the saving-retention coefficient.

However, when there are common causes that drive both saving and investment, we could observe a positive correlation between saving and investment even though exogenously increased saving does not raise investment. These common sources can either affect all countries or be specific to each country. That is, common sources can be decomposed into components that are (i) common across all countries' saving and investment (global factors) and (ii) common across saving and investment within each country (country-specific factors). Formally, suppose that the true data-generating processes (DGPs) for saving and investment are

$$\begin{aligned} S_{it} &= \gamma_i^{S\prime} G_t + \lambda_i^{S\prime} F_{it} + S_{it}^{exo} \\ I_{it} &= \gamma_i^{I\prime} G_t + \lambda_i^{I\prime} F_{it} + I_{it}^{exo}, \end{aligned} \tag{2}$$

where G_t is a vector of global factors that affect saving and investment across all countries, and F_{it} is a vector of country factors for country i that affect saving and investment in country i only. γ_i^S and γ_i^I are global factor loadings, and λ_i^S and λ_i^I are country factor loadings for country i. S_{it}^{exo} and I_{it}^{exo} refer to the idiosyncratic components in saving and investment that are independent of the global or country-specific factor components.

Then, Eq. (1) is rewritten as

$$I_{it} = \alpha + \beta S_{it} + \delta_i' G_t + \psi_i' F_{it} + \varepsilon_{it}, \tag{3}$$

where $\delta_i = -\beta\gamma_i^S$ and $\psi_i = -\beta\lambda_i^S$. Suppose that one employs observed saving S_{it} in the estimation of Eq. (1) instead of using S_{it}^{exo}, as has often been done in many previous studies. Then, the terms involving global factors and country-specific factors ($\delta_i' G_t + \psi_i' F_{it}$) would be included in the error term. These terms are correlated with saving, which results in the endogeneity problem of the independent variable. Then, the estimate of β would be biased and could not be interpreted as a measure of the effect on investment of exogenous changes in saving. The omitted terms vary both across countries and across time and thus will not be eliminated even after controlling for country and/or time fixed effects. Even if one intends to focus on the long-run relation by running a cross-section regression with time-averaged data as in

[2] See Obstfeld and Taylor (2004) for the survey of quantity-based and price-based tests of capital mobility and caveats of each approach.