The Feldstein-Horioka puzzle for industrial and developing countries

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**Abstract**

**Title:** The Feldstein-Horioka puzzle for industrial and developing countries

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**Keywords:** Capital market, saving retention coefficient (SRC), Feldstein-Horioka test, investments and savings.

**Problem:** Feldstein and Horioka interpret the saving retention coefficient (SRC) as a measurement of the closeness of a country and how well integrated the capital market was among 16 industrial countries. However, there have been many researches that have questioned Feldstein and Horioka’s theory.

**Purpose:** The purpose of this paper is to first replicate the existing Feldstein-Horioka test using 16 industrial countries, and then develop this approach by comparing the SRC from 16 developing countries as well as comparing the SRCs over time between these countries. The final investigation is to examine if the SRC increase as the time horizon increases.

**Method:** This paper applies the same method as Feldstein and Horioka did, using simple cross-sectional regression analyses to investigate the SRCs in respect of the aims of this paper.

**Conclusion:** The original Feldstein-Horioka test is not possible to entirely replicate, although, this paper shows rather similar results. The SRCs show positive correlations between domestic savings and domestic investments in all investigations. The SRCs for the industrial countries are greater that the SRCs for the developing countries in both the time periods and the SRCs do increase over time for both countries. Finally, the SRC does increase as the time horizon increases as we expected.
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1) Introduction

(i) The problem

Martin Feldstein and Charles Horioka were the two economists who first documented the Feldstein-Horioka puzzle; it is a widely discussed topic in economics, mainly in Macroeconomics and International Finance. Economic theory assumes that if there exist perfect capital mobility, a rational investor would invest in global market where it offers the highest return per unit of investment and this act would eventually drive up the price of investment until the return across other countries are similar. According to the standard economic theory with no government regulation in the international financial market, domestic saving rate should be uncorrelated with the domestic investment rate. In other words, saving from one country would be channeled to another country where investors are able to seek the highest returns. Feldstein and Horioka argue that there will be a low correlation between domestic savings and domestic investments assuming that the assumption is true, that there exist a perfect capital mobility.

In other words, borrowers would not need to borrow funds domestically if they can borrow from the international market at the world’s interest rate and savers would not show any preferences for investing domestically, but would lend to foreign investors and would not need to lend domestically. However, Feldstein and Horioka did observe a high correlation between domestic savings and domestic investments in their article “Domestic Saving and International Capital Flows”.

Although, a high saving retention coefficient (SRC) does not necessarily reflect how poorly or well integrated the capital market is.

A poorly integrated capital market indicates that a country is close to a closed economy and if a country has a closed economy, investments should equal to savings. In contrast, an open economy with a well integrated capital market does not mean that savings and investments are necessarily invested in foreign countries, it could be that investors find it more lucrative to invest domestically due to different reasons, even if the capital market is perfectly integrated. Typically, industrial countries tend to invest in industrial countries but there are much stronger reasons to invest in developing countries, since developing countries have less capital and therefore industrial countries may expect higher returns from the investments in developing countries. If there exist perfect capital mobility, an increase in investment in other countries will lower the marginal returns in those countries and increase investment in the domestic country where the relative marginal return on investment is higher, although in our modern economy, this will only occur with the absence of currency restrictions on the inflows and outflows of capital.

Moreover, the SRC does not necessarily need to be low in a perfect global capital mobility, since several factors can influence an investor’s choice of country to invest in, for instance, different countries have different risks, currencies are not perfectly correlated, different countries have different tax systems and regulations if the governments intervene foreign investments, interest rates can differ from country to country, growth of a country can affect a saver’s choice of country to save in and etc.
Furthermore, whether if a country has a closed or an open economy, the SRC has a similar interpretation. A country with an open capital market does not necessarily result in a very low SRC. However, an almost closed economy definitely implies a SRC that is close to one. In other words, a low SRC indicates an open economy in a country, although a high SRC cannot determine whether a country has a closed or an open economy. It can indicate a closed economy or an open economy with poorly functioning international capital market where investors prefer to invest domestically for various reasons.

With that being said, the saving retention coefficient does not necessarily reflect a country’s capital mobility; it solely reflects the relation between a country’s domestic savings and domestic investments as a share of its GDP and its openness.

(ii) A short review of literature

*Domestic Saving And International Capital Flows, Martin Feldstein and Charles Horioka (1980)*
Martin Feldstein and Charles Horioka were the first who discussed the relations between domestic savings and domestic investments. The authors use data from major industrial countries in the first part of the article and argues that a higher domestic saving rate in a country is associated with a higher domestic investment rate, in the second part the authors decompose the savings and investments into households, corporates and government sectors and then discuss the effects of the changes in the saving rate. Where there is little or no relations between domestic savings and domestic investments in a perfect world capital mobility and vice versa. On contrary, if there exists restrictions on the flows of long-term capital among countries such as portfolio preferences and institutional rigidities, an increase in domestic savings will reflect in additional domestic investments.

*Economic Growth, David N.Weil (2008)*
David N.Weil briefly mentions the Feldstein-Horioka’s test, which is to use a saving and investment model to estimate whether the capital flows are significantly enough to justify the assumptions of perfect capital mobility and to investigate their correlation.

*A Century Of Current Account Dynamics, Taylor M. Alan (2002)*
Alan relates saving and investment patterns in cross sectional regression analysis to formal time series properties by manipulating the budget balance.

*International Capital Mobility: The Saving-Investment relationship, Taylor M. Alan (1996)*
Alan conducts the Feldstein-Horioka test for both short and long run capital mobility. Using cross sectional regression analysis, the author presents the results using data from 12 industrial countries over almost 150 years, where the author shows a trend that generates monotonic relations of the saving-investment correlations in periods. In
addition, the author argues that time series regression analysis gives the ability to investigate the variations of capital flows of a specific country in the capital market.

*Six Major Puzzles, Obstfeld, Maurice and Rogoff (2000)*

Maurice and Rogoff analysed the following Six Major Puzzles:

- The home-bias-in-trade puzzle

  Why do people have strong preferences to consume in their home countries?

- The Feldstein-Horioka puzzle

  Why do observed OECD current account imbalances tend to be so small relative to the saving and investment when measuring over any sustained period?

- The home-bias portfolio puzzle

  Why do home investors strongly prefer to purchase home equity assets.

- The consumption correlation puzzle

  Why is consumption less highly correlated across OECD countries?

- The Purchasing-power-parity puzzle

  Why is the half-life of real exchange-rate innovations be three to four years

- The exchange-rate disconnect puzzle

  Why are exchange rates rather volatile and fundamental disconnect from the *forecasting puzzle* (Messe-Rogolf 1983) and the *neutrality-of-exchange-rate-regime puzzles* are *manifestations* (Baxter Stockman 1989)

The authors attempt to give a deeper understanding in all mentioned six puzzles and in order to give a deeper understanding in the key friction among these puzzles that is the international trading costs in the goods market.

(iii) **The aims of the thesis**

The aims of the thesis are to first replicate the original Feldstein and Horioka’s test presented in their article *Domestic Savings And International Capital Flows (1980)* and investigate how well does the Feldstein-Horioka test apply to the modern world, as well as applying the Feldstein-Horioka test to the developing countries and compare the saving retention coefficients for industrial and developing countries during the time period of 1960 to 1974.

In addition, this paper will further investigate how the saving retention coefficients behave over time for both industrial and developing countries and how it varies as the time horizon increases for all the industrial countries.

In order to replicate the Feldstein and Horioka test and make comparisons between industrial and developing countries, a subset of the data from 1960 to 1974 will be extracted from 16 industrial and developing countries. When applying the FH test to the modern world, the choice of dataset will be discussed in the methodology section.

Moreover, the investigation of how the saving retention coefficient varies as the time horizon increases will be analyzed, in other words, will the SRC increase when the time increases by five additional years after each estimation with a starting time period of 2007-2011, 2002-2011 that goes all the way back to 1977-2011?
(iv) Limitations

There are several interpretations of the Feldstein and Horioka coefficient but a few issues arise although they were measured correctly. Firstly, what does the saving retention coefficient (SRC) mean? And secondly, what does it mean in the context of international capital mobility?

These issues might consider as incorrect execution and interpretation (as mentioned briefly in the problem section).

Regarding the execution, is cross sectional regressions analysis a more relevant method to use for the estimation of 16 countries during a period of time or use time series regressions analysis as a method for one country over periods of time?

In time-series, one perspective is that it only allows one country (in this paper) to vary over time; another perspective could be that, what caused the saving-investment ratio to deviate from one year to another in one country? Possibly caused by a global shock at that point of time or new restrictions implemented by the government, which caused an increase or a decrease in the country’s capital mobility.

In contrast, cross sectional analysis does not allow researchers to look for changes over time, it allows regression analysis with a larger sample size in one specific period of time and therefore, it allows comparisons between two sample sizes in one period of time and the two different sample sizes in this case are the industrial and developing countries.

What does it mean using two different sample sizes and two different regression methods?

The estimate of $b$ in time-series analysis, which is the slope of the independent variable, is a more suitable tool to measure the short run capital mobility since it captures the movement over time. While the estimate of $b$ in cross sectional analysis is a more suitable measurement for the long run capital mobility, since it gives a “snapshot” between each country’s saving and investment ratios in one specific time period. Taking them into consideration, cross sectional analysis would be a more suitable tool to investigate the relation between the saving-investment ratios between countries.

The following contains a few additional limitations in our investigations.

Firstly, to compare the data collected as Feldstein and Horioka presented in the article Domestic Saving And International Capital Flows where there are 16 industrial countries in total, which this current paper will as well use the same 16 industrial countries in order to replicate the Feldstein-Horioka test using cross-sectional regression analysis. The question is, since Feldstein and Horioka presented this saving-investment relation in 1980, is the Feldstein-Horioka test still applicable in our modern time? One point that is worth noting is that, there is still no research that fully supports the original Feldstein-Horioka test.

Secondly, there are limited literature that have done similar extensions as the ones in this paper; due to many articles do not contain sufficient theories about the
comparisons between industrial and developing countries and how the SRC varies as the time horizon increases.

Thirdly, the investigation based on the existing theory regarding the long-run investigation does not cover the short run aspects, in other words the results will not reflect the domestic savings-investments during the business cycles.

Lastly, there are a few missing data for the key variables from the data collection in order to calculate the countries’ savings and investments originated from the Penn World tables. As a result, the analysis of the results for all digital figures will not be hundred percent accurate.

With that in mind, one additional issue remains and that is the exact data that Feldstein and Horioka used, according to the their article “Domestic Saving and International Capital Flows”, the source from their data was obtained from National Bureau of economic research and the authors did not specify which exact data they used and it requires the exact data from the exact time period, which is from 1960 to 1974, in order to completely replicate the Feldstein-Horioka test.

However, the aim of this paper is not only to replicate the test but to extent it one-step further by including 16 developing countries and apply to our modern world.

Surprisingly, all data sources do not give identical values for the same variables, in other words, it is rather difficult or impossible to find the exact data as Feldstein and Horioka used. Even if the variables are the same, the numbers still deviate from each other depending on which data sources that the data come from.

Will this create a problem? The selections of data will be explained in the data section further down.

Moreover, the simple cross sectional regression only contains one independent variable, in other words, how does the investment ratio behave when the saving ratio changes? There are many exogenous variables that can have influences on investment in a country, which are difficult to include, due to the first aim of this paper is to replicate the Feldstein-Horioka test and then extend it with different comparisons, which means the same equation must be used.
(v) The methodology

First of all, literature need to be found and settled, where articles will be obtained from the Internet, listed in the references section. Then, data collection is required by obtaining it from the Penn World Tables database or other websites for all the necessary variables, such as GDP at the current price, investment, consumption and additional variables to calculate the required variables if the mentioned variables are not given.

Moreover, the tool to conduct regression analyses is Excel and estimates the coefficient that appeared in the Feldstein and Horioka’s article Domestic Savings And International Capital Flows. The results will be shown in table 1 with the replication and the application of the Feldstein-Horioka test for the developing countries.

The estimate of $b$ can easily be obtained by running simple cross sectional regression with the data using Excel, where $(I/Y)_i$ is the ratio of gross domestic investment to gross domestic product in country $i$ and $(S/Y)_i$ is the corresponding ratio of gross domestic saving to gross domestic product in country $i$.

$$\left(\frac{I}{Y}\right)_i = a + b \left(\frac{S}{Y}\right)_i$$  

(1)

The intuition behind this equation according to Feldstein and Horioka is, with perfect world capital mobility, the estimate of $b$ would essentially be zero, since country $i$ can simply invest elsewhere with higher returns on its investments, assuming identical tax schedules among countries. In contrast, the estimate of $b$ close to one would imply a large share of country $i$’s incremental saving remains in the home country. In other words, the domestic saving rate would be independent from the investment rate if there exist perfect capital mobility globally.

Originally, Feldstein and Horioka intended to use 21 industrial countries, however, they have deleted five countries in their analysis due to these five countries have switched their methods of calculating their national income during the time when Feldstein and Horioka collected data from the database Penn World Table.¹ In order to replicate the original Feldstein-Horioka test for the remaining 16 countries, data will be obtained from The Penn World Table version 5.6 for the identical countries (List of countries are presented in the Appendix) to create an identical or very similar table as the Feldstein-Horioka’s.

Furthermore, these industrial countries will be put into one category and another category will contain 16 developing countries in 1960-1974, together with the results of the developing countries, where they will be discussed in short.

¹ The five countries Feldstein and Horioka deleted were France, Luxemburg, Norway, Spain and Switzerland.
Moving on, what time period should be implemented to the regression analysis, 5, 10, 20 or even 50 years? Let’s start with a business cycle and the very long run where T equals to the number of years.

Suppose T=5, which is considered a time period of a regular business cycle. Suppose a country is experiencing a recession, which implies that the country may borrow funds from abroad, resulting in capital inflows and capital outflows for the lenders. In contrast, another country is experiencing a boom, indicates that the country may lend funds to foreign countries, which indicates capital outflows and capital inflows for the country in need. On corollary, one would expect a low saving retention coefficient (SRC) from the scenarios above.

Let’s now look at the very long-run, suppose T=50, a country should have been able to paid back all their debts during this time period and this means that the capital account would equal to zero and capital outflows/inflows would also equal to zero, implying that the country is quite close to the closed economy.

To investigate further, suppose T=20, this is more tricky as it can be considered as a short and long run time period. For some countries, this could mean that they were close to closed economies if they have managed to paid back all their debts, implying capital accounts would be equal to zero and capital outflows/inflows would also equal to zero, i.e. same argument as the previous case. In contrast, if some countries were still struggling to stabilize their economies, funds from foreign countries would be needed to invest and boost domestic economies, in that case, the capital accounts does not equal to zero. However, since T=20 is an intermediate case, countries would slowly stabilize their capital inflows/outflows and therefore, one would expect a SRC roughly around 0.5.

What if T=36 years? 36 years is a sufficient long period of time to exclude all the business cycles and countries were able to stabilize from a boom or recession and therefore, the SRC should be fairly close to one but not as close as the SRC for T=50.

However, the original Feldstein-Horioka test uses 15 years for their investigation, therefore this paper are going to choose an addition of 15 years with the latest available data for all countries. Since the Feldstein-Horioka test was conducted in 1980, it would be interesting to compare the SRC to our modern world; in other words, it would be reasonable to compare the SRC in 1960-1974 with the SRC in 2001-2015, using the same countries, as mentioned in the aim of the thesis section. But, due to several developing countries did not have the data available beyond 2011 and therefore, the additional time period is going to be 1997-2011.

Another interesting way to look at the Feldstein-Horioka test is to test whether the SRC increases as the time horizon increases, in other words, does the SRC increases when the subset of time increases to the full dataset from 1977 to 2011 as mentioned in the aims of the thesis section that supports the hypothesis in the beginning of this page. Then, an additional cross sectional regressions will be conducted for the industrial countries to investigate if the previous hypothesis holds, that is if the SRC does increase as the time horizon increases for all 21 countries (will be explained further in the results section).
2) **The analyses**

Before presenting the results, one may assume that the saving retention coefficient (SRC) for industrial countries to be higher than the SRC for the developing countries, since the industrial countries were relatively more open for trade in comparison to the developing countries.

Although, will the statistical results be consistent with the hypothesis?

**(i) Data**

All data was obtained from *Penn world Table* database version 5.6 and the version 8.1 and the link can be found in the references section at the end of this paper.

The data variables were collected from the database and obtained the following variable that are necessary to calculate the saving and investment ratios for the investigations of this paper. According to the Macroeconomics Theory of gross domestic product (GDP) relations among investment, consumption and government expenditure, the equation is defined as

\[ Y = C + G + I + NX \]  \hspace{1cm} (2)

Where, \( Y \) = Gross Domestic Output

\( C \) = Private Consumption

\( G \) = Government expenditure

\( I \) = Investment

\( NX \) = Export - Import

And saving (S) can be defined: \( S = Y - C - G \)  \hspace{1cm} (3)

To further emphasis why the estimate of \( b \) must equal to one if a country is completely closed from trade in goods and services. If it is the case, the net export of that country would equal to zero and therefore obtaining the following equation from equation (2):

\[ Y = C + G + I \]  \hspace{1cm} (4)

By combining equation (3) and (4), \( S = I \) must hold for a closed economy, which implies that estimate of \( b \) must equal to one and the intercept (a) must be zero in equation (1) for this relation to hold.

Starting with the replication of the Feldstein and Horioka puzzle, the chosen variables are the same as the Feldstein-Horioka test from their article (16 industrial countries). According to the database PWT 5.6, the indicators \( cc, ci, cg \) of the current GDP were used for the analysis, where the \( cc \) indicates the current consumption, \( ci \) indicates the current investment and \( cg \) indicates the government expenditure. The time period extracted from the dataset is from 1960-1974. To complete the investigation, another 16 developing countries data is collected to complete the comparison between industrial and developing countries. After the collection of all data, the column \( cs \) (current saving as a share of GDP) can be calculated by the equation \( 100 - cc - cg \) where 100 means the current GDP as a 100 shares or percentage. Due to all the indicators in the tables are presented as shares of GDP, which implies that GDP can be defined and used by 100. After the first result of \( cs \) is calculated, the other \( cs \) for each year can simply be found by dropping down the first one. This approach will be used to calculate \( cs \) with the correct column indications for all countries.

To replicate the Feldstein and Horioka regression approach, calculations of the
average ratios of investments and savings are needed; the table in the Excel shows the column of investments in the time period of 1960-1974. The next step is to sum up the whole column and divide it by 15 to obtain the average ratio for investment for the first country and this can be presented by inserting the function as: =SUM(B3:B17)/15 for example (can be found in the excel sheet). Using the same process, the saving average ratio for 15 years data can also be found using the same function =SUM(D3:D7)/15 . This process will be applied for all countries during all time periods in respect to the aims of this paper.

The application of cross-sectional regressions can now be done by using Excel to begin with the investigations, after all the average saving-investment ratios have been calculated both industrial and developing countries.

Data for the investigation of how the saving retention coefficient (SRC) varies over time was collected from version 8.1.

One thing that should been noticed is that all the expressions have no space between each letter and number.

Feldstein and Horioka conducted the saving-investment investigation in 1980 and obtained the data available in 1976, which means their data collection has 40 years difference from this current paper. However, the Penn World Table database updates their data regularly and made it difficult to collect the exact data and as a result, the regression outputs may deviate from and make it impossible to fully replicate the original Feldstein-Horioka test.

The attempt for the investigation in how the SRC varies over time will be applied with the data from 1977 to 2011 from The Penn World Table version 8.1 in the results section. The reason of using separated versions from the replication of the Feldstein-Horioka test is that there is no data beyond year 1990 for all the industrial countries and therefore, two different versions are necessary for two different investigations, as mentioned previously.

The lists of all countries are presented in table 6 and table 7 in the Appendix section, as well as table 8, where is presents all countries’ Gross domestic production (GDP) as a share of capita (K) and export (EX) as a share of GDP to see if the chosen developing countries were indeed “poorer”, due to these countries have less GDP/K and EX/GDP than the industrial countries.

In addition, table 9 presents the saving-investment ratios for all 21 industrial countries during 1977-2011.
3) Results and findings
   (i) The replication of the Feldstein-Horioka test

   Table 1
   Comparison between the replication and the original Feldstein-Horioka test (1960-1974).

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard error</th>
<th>P-value</th>
<th>R-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replication</td>
<td>0.7645</td>
<td>0.0970</td>
<td>1.63E-06***</td>
<td>0.82</td>
</tr>
<tr>
<td>Feldstein-Horioka test</td>
<td>0.887</td>
<td>0.074</td>
<td>9.49E-09***</td>
<td>0.91</td>
</tr>
</tbody>
</table>

   • Parameter estimates refer to the equation (1) in the paper and all equations are based on observations for 16 countries
   • * P-value significance level of 5 %
   • ** P-value significance level of 1 %
   • *** P-value significance level of 0.1 %

   The results do deviate from the original test by Feldstein and Horioka, in the article “Domestic Saving and Capital Flows” their estimate of $b$ is 0.887 (S.E = 0.074) and 0.76 (S.E = 0.097), that has a significance level of 0.01% for this paper.
   The reason for this deviation is mainly due to the data, since the data was not collected from the same version as Feldstein and Horioka did, although it is from the same database (Penn World Table).
   To answer the previous question regarding if the data collected from a different source could create any problem, and the answer is yes and as a result, a complete replication of the Feldstein-Horioka test was not possible but this current paper does present similar results, where the coefficient is rather high and shows a highly correlated relation between domestic savings and domestic investments.
(ii) Extensions and comparisons

Table 2
Cross-sectional regression analysis for industrial and developing countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Time period</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>P-value</th>
<th>R-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>1960-1974</td>
<td>0.7645</td>
<td>0.0970</td>
<td>1.63E-06***</td>
<td>0.8160</td>
</tr>
<tr>
<td>Developing</td>
<td>1960-1974</td>
<td>0.8510</td>
<td>0.0651</td>
<td>3.07E-09***</td>
<td>0.9244</td>
</tr>
<tr>
<td>Industrial</td>
<td>1997-2011</td>
<td>0.0509</td>
<td>0.0922</td>
<td>0.5896</td>
<td>0.0213</td>
</tr>
<tr>
<td>Developing</td>
<td>1997-2011</td>
<td>0.4097</td>
<td>0.0827</td>
<td>0.0002***</td>
<td>0.6370</td>
</tr>
</tbody>
</table>

* The data set of 1960-1974 was obtained from the Penn world table, version 5.6
  The data set of 1997-2011 was obtained from the Penn world table, version 8.1

* P-value significance level of 5 %
** P-value significance level of 1 %
*** P-value significance level of 0.1 %

Table 2 shows two different sets of time periods with respective results, where the correlations between savings and investments are all positive, except for the coefficient (0.05) due to insufficient evidence.

As a whole, the table shows all the coefficients for both kinds of countries are statistically significant, except the industrial country in 1997-2011 with a p-value of 0.59, which indicates that the coefficient is statistically insignificant.

The table also shows the R-squares of the Industrial countries for both time periods are lower than the R-square for the developing countries. In general, the higher the R-square is, the better model fits the data, but from the research of many economists who argue that: the R-squares cannot fully interpret the relations of this establishment; even if it can be estimated into the relations.

The interpretation of R-square is the percentage of the variations for the dependent variable that can be explained by the independent variable; for instance, 82 percent of the variations in investment can be explained by savings for the industrial countries during 1960 to 1974.

In addition, the results imply that the correlations between domestic investments and domestic savings are rather high.

The saving retention coefficient (SRC) changed for both industrial and developing countries from 1960-1974 and 1997-2011 in table 2. The coefficients declined and to compare the industrial and developing countries, the SRC for the industrial countries is less than the SRC developing countries in the same time period (1960-1974) and the SRCs in 1960-1974 are higher than the SRCs in 1997-2011 for both countries.
The exact reasons why that happened are due to rather complex factors, and this paper are going to analyze some of them according to all the research and present a couple factors that may have caused this.

Firstly, why are the saving-investment coefficients rather high in 1960-1974 in both industrial and developing countries?
One would need to look at the background to answer this question. For the industrial countries after the War 2 and the Technic revolution, the economy in industrial countries had extremely high speed of growth, where one factor played a key role and that is the country size relatively to its gross domestic product (GDP). As many authors mentioned such as Tsung-WuHo, Ru-Lin Chin, Kevin E.Henrickason and Ryan W.Herzog, it can be measured as on country’s GDP as a share of the sum of all countries’ GDPs. According to their research, the more the GDP in one country increases, the more the coefficient increases in general, although it is against with the coefficient (as the existing articles mentioned the country size effect has time-varying effects on saving and investment ratios). Due to this time period, the world’s GDP grew rapidly, resulted in a higher coefficient where they preferred to invest domestically rather than abroad, especially individual or private investors. Due to all the countries wanted to restore their own countries first, the industrial countries became from the production form to Technology and Capital-intensive form and meanwhile, the country's government controlled the capital to invest abroad instead, because developing countries began to change their economic systems to Labor-intensive forms, which they borrowed from the industrial countries. During this time, all the countries began to transform their economic and output styles that increased the capital flows among these countries and the SRC surely became rather high. In depth, USA was the leader of the global economy where all the trades and transfers were based on US dollar where the States lent a large amount of funds to both industrial and developing countries, such as Japan. It is clear that from all the situations above during this period, the world capital mobility flowed more where all the countries invested and saved (debts) more as well.

Secondly, why did the SRCs decline for both industrial and developing countries in same time period 1997-2011?
It is a rather complex question to answer but there are a few reasons that this paper wants to further analyze:
To begin with, the global economic integration improved, where the industrial and developing countries have mostly completed their economic system transformations. Domestic economy became more stable and each country started to implement individual-development steps and developing countries grew at a slightly faster pace than the industrial countries, which led to a smaller gap between the poor and the rich. Moreover, the whole world’s capital inflows and outflows became less. Individual investors realized that the industrial countries still had a big role of the world’s economy system, although with the growth of the Third world, their controlling power decreased. Simultaneously, countries like China, Japan and other developing countries
grew rapidly. Most industrial countries changed from being the creditors to the debtors. Another aspect is that, most debts that the industrial countries lent may have already been paid back from the developing countries and as a result, saving, investment and the capital had not transform too obviously, which could be one of the reasons of why the coefficients are lower.

Furthermore, the global openness in the trade market is a key factor, which is also why many existing articles have mentioned this and it is because the global economy integration in any market is the biggest influence for all the countries in the financial market and it must have a broader aspect in the trading factors. Export-Import and saving-investment, these variables are included in a country’s GDP and as long as the global influence on these variables become stronger, they must also have big influences on the saving retention coefficients that this current paper is investigating. As we all know, saving can be calculated by investment and net export but with a more open trade market, more trade would occur and the net export would become larger, which implies that the differences between savings and investments are also going to be larger, causing bigger gaps between savings and investments for the countries, which in turn caused the SRC to be close to zero. This could be the reason the coefficients are lower in the later time period in 1997-2011 than the period of 1960-1974, but as long as the world is completely open for trades, the gaps between investments and savings will become zero and during that time, the SRC can no longer represent as the relation between investments and savings, since it would become zero.

Additional reason could be the data collection, which used the current GDP factors, that means that all the data also depends on the current international saving interest rates and domestic saving interest rates. According to Microeconomics and Macroeconomics, these two interests rates affect investments and savings. If both international and domestic interest rates become closer and closer, then the return of investments and savings will as well become closer, which in turn will cause the coefficients to become lower. It can be that the difference between international interest rates and domestic interest rates became less due to all the countries attempted to manipulate inflations and deflations and carried out the fixed and floating interest rates. Then, the aspect above can also be one of the reasons of why the coefficients became lower during this time period.

Thirdly, why are the SRCs lower for the industrial countries than the developing countries in both time periods?

One reason could be that, due to industrial countries were “wealthier”, investors from a “wealthier” country chose to invest in industrial countries where returns may have been higher or the interest rates may have been higher than the developing countries, resulted in investors chose to save their money in their own countries to seek higher returns.
Another reason could be the ratios presented in table 6 and table 7, during these two time periods, the differences between the investment ratios and the saving ratios of industrial countries are less than the developing countries, this means that the gap of exports and imports in the industrial countries become less than the gap in developing countries, this situation strongly proves the previous hypothesis regarding the lower net export, the lower coefficient of saving and investment will become.

In addition, a developing country may have chosen to import cheaper goods and services due to lower exchange rates between an industrial country and a developing country, indicating in a capital inflow for the developing country and a capital outflow for the industrial country.

Moreover, developing countries may have experienced a shortage of capital and had to be financed by other countries to manage their domestic investments. Similarly, industrial countries may have managed to afford their own investments and did not need foreign funds, which indicates a less capital flows among wealthier countries or they simply had more access to the global financial market that could have caused a lower SRC.

Income per capita is another variable that can have a significant role in the comparisons between the industrial and developing countries as well, after all, it is the wealth of a country and capital flows that created differences between these two categories. Developing countries are “poorer”, indicating that their income per capita are lower and may have created more obstacles to channel funds across borders, such as government restrictions on their financial markets. In addition, their domestic currencies were not as strong as the industrial currencies; investors may have preferred to invest domestically instead, which led to a higher SRC. In contrast, since industrial countries tend to invest in other industrial countries, governments from industrial countries may have corporate to reduce restrictions to channel funds across borders and led to a lower SRC.

(iii) Additional statistical analysis

The boundaries to classify if the countries are open or closed are vague, i.e. what should the saving retention coefficient (SRC) lie between to be classified as relatively open or relatively closed?

There are no strict boundaries, however this paper is going to provide further comparisons to investigate the industrial and developing countries’ openness and closeness by using statistical analyses with two different null hypotheses. Previously in table 2, the regression analyses were focused on the estimate of $b$ with a null hypothesis that the estimate of $b$ equals to zero to investigate the country’s openness. However, it would also be interesting to test the other endpoint, that is the closeness of the countries and it can be done by additional regression analysis with a null hypothesis of the estimate of $b$ equals to one.

$H_o: b = 0$

$H_c: b = 1$
Where, 

- $H_o$: Null hypothesis that the estimate of $b$ equals to zero
- $H_c$: Null hypothesis that the estimate of $b$ equals to one

Table 3
Cross-sectional regression analysis for industrial and developing countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Time period</th>
<th>Coefficient</th>
<th>P-value $H_o: b = 0$</th>
<th>P-value $H_c: b = 1$</th>
<th>R-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>1960-1974</td>
<td>0.7645</td>
<td>1.63E-06***</td>
<td>0.02926*</td>
<td>0.8160</td>
</tr>
<tr>
<td>Developing</td>
<td>1960-1974</td>
<td>0.8510</td>
<td>3.07E-09***</td>
<td>0.03815*</td>
<td>0.9244</td>
</tr>
<tr>
<td>Industrial</td>
<td>1997-2011</td>
<td>0.0509</td>
<td>0.5896</td>
<td>6.52E-08***</td>
<td>0.0213</td>
</tr>
<tr>
<td>Developing</td>
<td>1997-2011</td>
<td>0.4097</td>
<td>0.0002***</td>
<td>5.03E-06***</td>
<td>0.6370</td>
</tr>
</tbody>
</table>

* Same as table 2 with an additional null hypothesis $H_c: b = 1$ and without the standard errors.
* P-value significance level of 5%
** P-value significance level of 1%
*** P-value significance level of 0.1%

In table 3, the null hypothesis ($H_o$) measures the openness of the countries and the other null hypothesis ($H_c$) measures the respective closeness. Before obtaining the p-value for the null hypothesis ($H_c$), the t-statistics must be calculated first, using the following equation:

$$t_i = \frac{b_i}{sd_i}$$

Where $t = T$-statistic
- $b_i$ = Estimate of $b_i$ from the null hypothesis ($H_o$)
- $sd_i$ = Standard deviation from the respective $b_i$

When the t-statistics are obtained, each p-values can now be calculated by using Excel.

There are a few points worth noting in the results. Firstly, both p-values for the null hypothesis of $H_o$ that $b = 0$ are significant at the level of 0.1% for the industrial and developing countries during 1960-1974, which implies that the saving retention coefficients (SRCs) for both countries are greater than zero during this time period were not completely open. However, the respective p-values for the null hypothesis $H_c$ that $b = 1$ are only significant at the level of 5%, which indicate that both industrial and developing countries during this period were leaning towards closed economies, in other words, they were most likely experiencing a more closed economy than an open economy.
Secondly, the null hypothesis \((H_0)\) is not rejected and the other null hypothesis \((H_c)\) is rejected at the 0,1% significance level for the industrial countries during 1997-2011. Both p-values strongly indicate that the industrial countries were not closed but were relatively close to open economies. Last but not least, both null hypotheses \((H_0)\) and \((H_c)\) for the developing countries during 1997-2011 are rejected, since both of the p-values were significant at the level of 0,1%, indicating that the developing countries were in an intermediate position between open and a closed economies.

**(iv) The saving retention coefficient as the time horizon increases**

One last investigation from the aim of the thesis is to allow the saving retention coefficient (SRC) to vary as time increases, which is an extension of the Feldstein-Horioka test. Feldstein and Horioka excluded five countries in their test in 1980 due to theses countries have changed their ways of calculating their national accounts, but since this is an updated version (version 8.1) in the database *Penn World Tables* where all countries have calculated their national accounts with the same method, all 21 countries are included in this particular investigation, due to there are no reasons to exclude them anymore.

Before showing the results, one would expect an upward sloping line since the longer time period it is, that is the more “closed” are the countries towards trade and capital flows and thus, the incremental SRC should increase for each additional five years.

<table>
<thead>
<tr>
<th>Years</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>P-value</th>
<th>R-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977-2011</td>
<td>0.1584</td>
<td>0.0711</td>
<td>0.0382*</td>
<td>0.2070</td>
</tr>
<tr>
<td>1982-2011</td>
<td>0.1484</td>
<td>0.0731</td>
<td>0.0565</td>
<td>0.1784</td>
</tr>
<tr>
<td>1987-2011</td>
<td>0.1292</td>
<td>0.0774</td>
<td>0.1112</td>
<td>0.1281</td>
</tr>
<tr>
<td>1992-2011</td>
<td>0.0967</td>
<td>0.0731</td>
<td>0.2015</td>
<td>0.0844</td>
</tr>
<tr>
<td>1997-2011</td>
<td>0.0777</td>
<td>0.0704</td>
<td>0.2840</td>
<td>0.0601</td>
</tr>
<tr>
<td>2002-2011</td>
<td>0.0594</td>
<td>0.0728</td>
<td>0.4243*</td>
<td>0.0339</td>
</tr>
<tr>
<td>2007-2011</td>
<td>0.1536</td>
<td>0.0726</td>
<td>0.0480*</td>
<td>0.1905</td>
</tr>
</tbody>
</table>

* The data set was obtained from the Penn world table, version 8.1
  
* P-value significance level of 5%  
** P-value significance level of 1%  
*** P-value significance level of 0.1%
The null hypothesis from table 4 is that $b$ equals to zero and clearly, the coefficients in the time periods of 1982-2011, 1987-2011, 1992-2011, 1997-2011 and 2002-2011 are not rejected since the p-values of the coefficients are statistically insignificant. Since one cannot reject that these countries were completely closed, implying that the countries were fairly open for trades.

In contrast, the remaining coefficients in 1977-2011 and 2007-2011 are statistically significant at the level of 5%, which implies that the null hypothesis that $b$ equals to zero are rejected at 5% significance level and the alternative hypothesis that $b$ does not equal to zero are not rejected, which implies that the SRCs are greater than zero and the countries were fairly closed for trades in comparison to the rest of the periods. Analytically, the coefficient $(0,15)$ for 2007-2011 should be the lowest one since it has the shortest time period of 5 years, although it is relatively high in comparison to the rest of the coefficients.

There have been several financial crises, from a country’s individual crisis to global financial crisis such as, the Black Monday (1987) and the Black Wednesday (1992-1993). However, one factor that is notable is the financial crisis that occurred in 2008.

Originally, due to the financial crisis one could expect that, the SRC should be lower, since on one hand, countries with capital scarcity would borrow funds from foreign countries with abundant capital, although on the other hand, even countries with abundant capital may not afford to lend funds to countries with needs, as they need to use domestic savings to boost their own domestic investments.

For these reasons, the governments may have had attempted to increase domestic consumptions, by investing domestically instead of internationally to stimulate their domestic economies, which could possibly be reached by investing in projects to kick start domestic firms such as, constructing new infrastructures to keep such firms running or similar strategies to hopefully lead to higher domestic consumptions. In addition, the governments may have tried to stimulate its economies by decreasing the interest rates to boost the general investments and its gross domestic product (GDP).

Moreover, investors were less optimistic in the financial market when the exchange rates were unstable and returns from investments were more volatile when there were more uncertainties for future returns from their investments. Thus, the mentioned scenarios above would reduce the capital flows among countries and hence, a higher SRC during 2007 to 2011.

The lowest value of the coefficient $(0,06)$ in 2002-2011 had a time period of 10 years. The reasons behind why the coefficient $(0,154)$ jumped to $0,06$ could be that, the coefficient between 2002-2006 may have balanced out the SRC with an extremely low or close to zero and substantially balanced out the coefficient $(0,154)$ over the rest of the time period.

Possibly due to the excessive accumulations of debts and highly speculative investments, where a significant number of investments failed spectacularly, that may have been one of the factors that caused the financial crisis in 2008, in that case, the SRC should be rather close to zero.
The increase of the SRC from 1977-2011 to 2002-2011 is not surprising without taking the consideration of the first coefficient (0.154), since 25 years is a fairly long time period where countries have had more stable savings-investments (exports-imports) relations, although different countries recover in different paces from different Macroeconomic shocks. But overall, the longer the time period is, the less “dramatic” should the savings-investments relations become, as they have excluded all the business cycles and the gaps between savings and investments (exports and imports) tend to become closer.

There are 34 years in the data set and it is a sufficient long time period for the industrial countries to recover from temporary shocks, from both shocks that originated from its own country and shocks originated internationally, which could be reflected from the upward sloping trend of the SRCs. Furthermore, these countries may have stabilized their economies and were less depending on foreign investments to maintain their own economies. As a result, these countries can transfer domestic savings to domestic investments. Further analysis could be that, domestic investments became more attractive when currencies fluctuations diminished, implying in a less volatile financial market and less lucrative returns from foreign investments.

Scatter plot 1
Scatter plot of all the coefficients from table 4.

In scatter plot 1, it is clear that the estimates of the saving retention coefficients form an upward sloping trend, visually, it is fairly consistent to the previous hypothesis that the short-run coefficient expect to be less than the long-run coefficient, from the methodology section (apart from the coefficient in 2007-2011).

Since the aim of this investigation is to see if the SRC increases when the time horizon increases and form an upward sloping line, two additional cross sectional regressions were conducted to obtain two coefficients of the fitted lines and to provide statistical evidence that the slopes of the fitted lines are indeed greater than zero. Due to there exist an “outsider” in the scatter plot and this paper are going to compare the outsider’s presence and absence in the results presented in table 5 using the following equation:
\[ \hat{b}_i = \alpha + \gamma T_i \]  
(6)

Where, \( \hat{b}_i \) - the estimate of \( b \) in its time period  
\( T \) - number of years  
\( i \) - goes from one to \( n \), where \( n = \) number observations

**Table 5**  
*Regression outputs of the coefficients from table 3.*

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard error</th>
<th>P-value</th>
<th>R-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclusion of the outsider</td>
<td>0.00174</td>
<td>0.00145</td>
<td>0.28239</td>
<td>0.22483</td>
</tr>
<tr>
<td>Exclusion of the outsider</td>
<td>0.00423</td>
<td>0.00028</td>
<td>0.00011***</td>
<td>0.98275</td>
</tr>
</tbody>
</table>

* P-value significance level of 5 %  
** P-value significance level of 1 %  
*** P-value significance level of 0.1%

**Graph 1**  
*Fitted line of the coefficients including the “outsider”.*
The coefficient (0.0017) with the inclusion of the outsider is greater than zero, indicating that it is an upward sloping line, however, the p-value is insignificant which provides no evidence that it is indeed an upward sloping line. In addition, the R-square of 0.225 reflects the poorness of the fitted line, due to the “outsider” (0.15) in the period of 2007-2011 presented in graph 1. Lets now look at the other regression with the absence of the “outsider”. It is obvious that the fitted line fits almost perfectly on the saving retention coefficients in graph 2, resulting in a significantly higher R-square of 0.983 and a statistically significant coefficient (0.0042), that is indeed greater than zero.

With the absence of the coefficient (0.0017), it should be clear that this investigation is consistent with the aim of this paper, concerning whether the saving retention coefficient does increase as the time horizon increases or not.
4) Summary and conclusion

Feldstein and Horioka claim that the saving retention coefficient (SRC) for one country reflects its capital flows and how well the country integrates its capital mobility in an international context. This paper argues that Feldstein and Horioka were not completely correct, the SRC only reflects how closed or open one economy is and the correlation between domestic savings and domestic investments, regardless in how well integrated the capital market is, however, it is still applicable to our modern world to investigate a country’s openness and the correlation between domestic savings and domestic investments.

From table 1, the results show the replication of the original Feldstein and Horioka test and the results did not look exactly as the original one, due to the data sources updates the national accounts regularly, making it impossible for this current paper to obtain the exact data as Feldstein and Horioka did in year 1976, as mentioned in the data section previously. Consequently, the regression estimate of \( b \) deviates from Feldstein and Horioka’s.

From table 2, the results show that the developing countries had higher SRCs than the industrial countries and the results also show that the SRCs decreased over time for both industrial and developing countries. Moreover, it should be rather intuitive that the SRC does increase as the time horizon increases, thus the results in table 5 are consistent with the hypothesis with the absence of the “outsider” that significantly affect the fitted line negatively. Concerning the data, much remains to be investigated in further work. It would be desirable to extend the sample to even more countries and longer time periods or include additional exogenous variables to obtain more accurate results.

There exist many research and extensions of the Feldstein Horioka test, although the real interpretation of the SRC remains unsolved. Since there exist no complete evidence that fully supports the Feldstein Horioka’s theory and there exist many contradictions as well on their interpretations of the estimate of \( b \). Furthermore, one should not solely look at the SRC when examining the openness/closedness of a country and how integrated the capital market is, since there are other variables that also reflect a country’s willingness to trade with other countries and the integration of the capital market such as, export as a share of a country’s gross domestic product.

This paper focuses on the replication and the extensions of the Feldstein-Horioka test, which hopefully can give a better understanding of their theories behind the Feldstein and Horioka puzzle and which factors that could have caused the variations of the SRCs, concerning the comparisons between the two categories of countries and over time.
5) References

Martin Feldstein and Charles Horioka “Domestic Saving and International Capital Flows”
Published by: Blackwell Publishing for the Royal Economic Society Stable URL:

Blackwell Publishing for the Royal Economic Society Stable URL:

2008-02-01, chapter 11


Alan M. Taylor Working Paper 5743
International capital mobility in history: The saving-investment relationship

6) Appendix

Table 6

Ratios for all countries (1960-1974)

<table>
<thead>
<tr>
<th>Industrial countries</th>
<th>$I/\text{GDP}$</th>
<th>$S/\text{GDP}$</th>
<th>Developing countries</th>
<th>$I/\text{GDP}$</th>
<th>$S/\text{GDP}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.2192</td>
<td>0.2134</td>
<td>South Africa</td>
<td>0.1900</td>
<td>0.2080</td>
</tr>
<tr>
<td>Japan</td>
<td>0.3188</td>
<td>0.3233</td>
<td>Brazil</td>
<td>0.1888</td>
<td>0.1849</td>
</tr>
<tr>
<td>Italy</td>
<td>0.3024</td>
<td>0.3021</td>
<td>China</td>
<td>0.1593</td>
<td>0.1633</td>
</tr>
<tr>
<td>UK</td>
<td>0.1848</td>
<td>0.1791</td>
<td>India</td>
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</tr>
<tr>
<td>Canada</td>
<td>0.2271</td>
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<td>Malaysia</td>
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</tr>
<tr>
<td>West Germany</td>
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<td>Turkey</td>
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</tr>
<tr>
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<td>Angola</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Belgium</td>
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<td>Colombia</td>
<td>0.1585</td>
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</tr>
<tr>
<td>Ireland</td>
<td>0.2333</td>
<td>0.1800</td>
<td>Indonesia</td>
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<td>Netherlands</td>
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<td>New Zealand</td>
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<td>Sweden</td>
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<td><strong>MEAN</strong></td>
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<td><strong>0.2558</strong></td>
<td></td>
<td><strong>0.1225</strong></td>
<td><strong>0.1181</strong></td>
</tr>
</tbody>
</table>

- Where $I/\text{GDP}$ stands for investments as a share of gross domestic product and $S/\text{GDP}$ stands for savings as a share of gross domestic product for respective country.
### Table 7

**Ratios for all countries (1997-2011)**

<table>
<thead>
<tr>
<th>Industrial countries</th>
<th>( \frac{I}{GDP} )</th>
<th>( \frac{S}{GDP} )</th>
<th>Developing countries</th>
<th>( \frac{I}{GDP} )</th>
<th>( \frac{S}{GDP} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0,2169</td>
<td>0,1696</td>
<td>South Africa</td>
<td>0,1668</td>
<td>0,1696</td>
</tr>
<tr>
<td>Japan</td>
<td>0,2616</td>
<td>0,2951</td>
<td>Brazil</td>
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<td>Senegal</td>
<td>0,1727</td>
<td>0,0449</td>
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<tr>
<td>New Zealand</td>
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<td>0,1457</td>
</tr>
<tr>
<td>Sweden</td>
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<td>0,2829</td>
<td>Thailand</td>
<td>0,2537</td>
<td>0,3033</td>
</tr>
<tr>
<td><strong>MEAN</strong></td>
<td><strong>0,2361</strong></td>
<td><strong>0,2622</strong></td>
<td></td>
<td><strong>0,2024</strong></td>
<td><strong>0,1984</strong></td>
</tr>
</tbody>
</table>

- Where \( \frac{I}{GDP} \) stands for investments as a share of gross domestic product and \( \frac{S}{GDP} \) stands for savings as a share of gross domestic product for respective country.
Table 8

*GDP per capital and export as a share of GDP for all countries (1960-1974)*

<table>
<thead>
<tr>
<th>Industrial Countries</th>
<th>GDP/K</th>
<th>EX/GDP</th>
<th>Developing Countries</th>
<th>GDP/K</th>
<th>EX/GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.4336</td>
<td>0.0555</td>
<td>South Africa</td>
<td>0.0983</td>
<td>0.2702</td>
</tr>
<tr>
<td>Japan</td>
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<td>0.1031</td>
<td>Brazil</td>
<td>0.0824</td>
<td>0.0690</td>
</tr>
<tr>
<td>Italy</td>
<td>0.2334</td>
<td>0.1528</td>
<td>China</td>
<td>0.0206</td>
<td>0.0373</td>
</tr>
<tr>
<td>UK</td>
<td>0.2800</td>
<td>0.2161</td>
<td>India</td>
<td>0.0262</td>
<td>0.0467</td>
</tr>
<tr>
<td>Canada</td>
<td>0.3252</td>
<td>0.2087</td>
<td>Malaysia</td>
<td>0.0664</td>
<td>0.4067</td>
</tr>
<tr>
<td>West Germany</td>
<td>0.3011</td>
<td>0.1993</td>
<td>Turkey</td>
<td>0.0743</td>
<td>0.0727</td>
</tr>
<tr>
<td>Austria</td>
<td>0.2434</td>
<td>0.2685</td>
<td>Angola</td>
<td>0.0352</td>
<td>0.2332</td>
</tr>
<tr>
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<td>0.1494</td>
<td>Benin</td>
<td>0.0414</td>
<td>0.1677</td>
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<td>0.4621</td>
<td>Fiji</td>
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</tr>
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<td>0.2902</td>
<td>Ethiopia</td>
<td>0.0100</td>
<td>0.1133</td>
</tr>
<tr>
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<td>0.2270</td>
<td>Egypt</td>
<td>0.0359</td>
<td>0.1735</td>
</tr>
<tr>
<td>Greece</td>
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<td>0.1167</td>
<td>Colombia</td>
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<td>0.1316</td>
</tr>
<tr>
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<td>0.3684</td>
<td>Indonesia</td>
<td>0.0219</td>
<td>0.1307</td>
</tr>
<tr>
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<td>0.4310</td>
<td>Senegal</td>
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<tr>
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<td>0.2326</td>
<td>Philippines</td>
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<td>0.2311</td>
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<td>0.0468</td>
<td>0.1866</td>
</tr>
<tr>
<td>MEAN</td>
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<td>0.2320</td>
<td></td>
<td>0.0500</td>
<td>0.1837</td>
</tr>
<tr>
<td>MAX</td>
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<td>0.4600</td>
<td></td>
<td>0.0983</td>
<td>0.4447</td>
</tr>
<tr>
<td>MIN</td>
<td>0.1259</td>
<td>0.0600</td>
<td></td>
<td>0.0100</td>
<td>0.0373</td>
</tr>
</tbody>
</table>

- Where GDP/K stands for gross domestic product per Capita and EX/GDP stands for export relative to the country’s gross domestic product.
Table 9

Ratios for all 21 industrial countries (1977-2011)

<table>
<thead>
<tr>
<th>Country</th>
<th>(\frac{I}{GDP} )</th>
<th>(\frac{S}{GDP} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0,2193</td>
<td>0,1916</td>
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<tr>
<td>Japan</td>
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<td>0,3366</td>
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<tr>
<td>Italy</td>
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<td>0,2704</td>
</tr>
<tr>
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<td>0,1703</td>
</tr>
<tr>
<td>France</td>
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<td>0,2187</td>
</tr>
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<td>Canada</td>
<td>0,2518</td>
<td>0,2632</td>
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<tr>
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<td>0,2429</td>
<td>0,2446</td>
</tr>
<tr>
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<td>0,2804</td>
</tr>
<tr>
<td>Austria</td>
<td>0,2769</td>
<td>0,2520</td>
</tr>
<tr>
<td>Belgium</td>
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<td>0,2290</td>
</tr>
<tr>
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<td>0,2456</td>
<td>0,2685</td>
</tr>
<tr>
<td>Finland</td>
<td>0,2864</td>
<td>0,3229</td>
</tr>
<tr>
<td>Greece</td>
<td>0,2659</td>
<td>0,1418</td>
</tr>
<tr>
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<td>0,3137</td>
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<tr>
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</tr>
<tr>
<td>Switzerland</td>
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</tr>
<tr>
<td>MEAN</td>
<td>0,1886</td>
<td>0,0896</td>
</tr>
</tbody>
</table>

- Where \(\frac{I}{GDP}\) stands for investments as a share of gross domestic product and \(\frac{S}{GDP}\) stands for savings as a share of gross domestic product for respective country.