

# **(IM)BALANCE OF SAVING AND INVESTMENT IN INSTITUTIONAL SECTORS OF NATIONAL ECONOMY**

**Kateřina Šimová**

---

## **Abstract**

The paper analyses the relationship between saving and investment in different institutional sectors of the national economy. The analysis at this level is essential in order to take into account the specificities of the different institutional sectors in generating their savings and investments. The research involves EU28 countries for the period 1995–2018. Sectors are briefly defined first, followed by definitions of the terms “saving” and “investment” in the different sectors. This is followed by an econometric verification inspired by the approach of Feldstein and Horioka (1980) using panel regression, which confirmed in all the institutional sectors that saving largely does not finance investment. On the other hand, it has been shown in previous studies that applying Feldstein and Horioka's analysis of the savings-investment relationship to the whole economy can lead to erroneous conclusions. Individual sectors are faced with different intertemporal constraints, i.e. there are differently tight relationship between saving and investment. The tightness of this relationship depends, among other things, on the access of individual sectors to financial markets.

**Key words:** gross national saving, gross capital formation, Feldstein–Horioka puzzle, national accounts, institutional sectors

**JEL Code:** E21, E22.

---

## **Introduction**

The question of the (im)balance of saving and investment and their relationship is intertwined with the whole modern economic theory. Nowadays, the issue of savings and investment relationship is gaining in importance due to the well-developed international financial market, whereby entities face a significantly smaller (intertemporal) budgetary constraint. Furthermore, investments can also be financed not only from saving, i.e. income not consumed, but also from “ex nihilo” funds on the financial markets. The paper examines the relationship between savings and investments at the level of sectors of the national economy.

This kind of analysis is essential because of the different behavior of individual sectors in generating saving and investment. The relationship between saving and investment was made famous by Feldstein and Horioka (1980), who used this simple relationship to analyse the (intertemporal) budgetary constraint of the whole economy and, thus, de facto study the (im)mobility of flows of international capital. Ultimately, they thus tested the fundamental logic of the intertemporal approach to balance of payments. Obstfeld and Rogoff (2001) rank Feldstein-Horioka puzzle among the six greatest puzzles in international macroeconomics.

Substantially less importance was attributed to the relationship between saving and investment at the level of different institutional sectors, although some of the basic approaches accentuate it (e.g., twin deficit theory or Barro-Ricardo hypothesis; Barro, 1974), and the current problem of so-called fiscalisation of impacts of debt crises intensifies the urgency of “sectoral analysis” of this relationship.

The paper aims to analyse the relationship between saving and investment in different sectors of the national economy. The research involves EU28 countries for the period 1995–2018.<sup>1</sup> The paper contents is as follows. Institutional sectors are briefly defined first, followed by definition of the contents of the very frequently (and oftentimes vaguely) used terms “saving” and “investment” in the different sectors. This is followed by an econometric verification inspired by the approach of Feldstein and Horioka (1980). The text ends with a brief summary.

## **1 Analysis of relationships between investment and saving of institutional sectors of national economy**

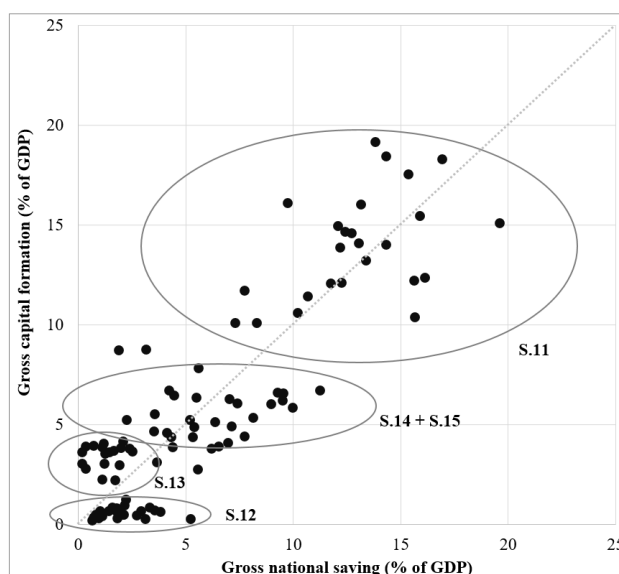
Figure 1 below shows the average values of gross capital formation (often referred to as “investment”)<sup>2</sup> and gross national saving (“saving”) for all institutional sectors of the EU28 countries as a percentage of the GDP. It follows from the figure that it is meaningful to deal with analysis of sectors instead of aggregated analysis due to the substantially different behaviour of sectors in forming saving and investment. The breakdown of categories into institutional sectors in this paper is based on the ESA 2010 methodology.

---

<sup>1</sup> See Pánková (2016) for empirical verification for the Czech Republic

<sup>2</sup> Many theory-laden texts and analyses use the term investment only for gross fixed capital formation, since it usually comprises the dominant part of gross capital formation. This neglects the items of change in inventories and net acquisition of valuables. In this paper, the term investment refers to gross capital formation.

**Fig. 1: Gross capital formation and gross national saving for institutional sectors of national economy**



Source: Eurostat, own processing

### 1.1 Brief characteristics of sectors

The European system of national accounts ESA 2010 (Eurostat, 2013) breaks the national economy down into the following institutional sectors (Hronová et al. 2019):

- Non-financial corporations (S.11) – the sector comprises market manufacturers producing goods and non-financial market services.
- Financial corporations (S.12) – the sector comprises institutions providing financial mediation services, insurance services and/or doing auxiliary financial services (ČSÚ, 2015).
- General government (S.13) – the sector comprises public non-market manufacturers providing non-market services and performing the role of distribution of revenues and national wealth.
- Households (S.14) – their main economic function is consumption or production of goods and market services (small-scale entrepreneurs).
- Non-profit institutions serving households (S.15) – they provide non-market services for households.

Due to the low level of importance of S.15 sector, the sectors S.14 and S.15 are often analysed together. The financial corporation sector S.12 is often left out from analysis.

## 1.2 Sectoral view of saving and investment

In this subchapter we focus on the definition of saving and investment from the perspective of individual sectors of the national economy.

### Disposable revenue and saving – sectoral view

From the perspective of basic macroeconomic identity, we obtain gross national saving as the difference between gross national disposable income and final consumption expenditure, or the sum of residents' savings in all the institutional sectors except the non-resident sector. National accounting offers a more exact perspective. From this angle, the saving is the balance on the use of disposable income account and the use of adjusted disposable income account. Disposable income is the balance on the secondary distribution of income account and adjusted disposable income is the balance on the redistribution of income in kind account and only concerns selected sectors. Saving corresponds to that part of income (either disposable or adjusted disposable) that has not been used for final consumption expenditure. From the point of view of different sectors, disposable income and saving can be defined as follows (Hronová et al. 2019):

- For the non-financial corporation sector, disposable income equals saving (sector S.11 has no final consumption expenditure).
- For the financial corporation sector, disposable income is the sum of saving and adjustment for the change in pension entitlements.
- For the household sector, disposable income is current income after taxation used for final consumption expenditure and saving.
- For sectors S.13 and S.15, disposable income equals current income after taxation.

If disposable income is increased or reduced by social transfers in kind, the result is so-called adjusted disposable income. Redistribution of social transfers in kind changes the amount of disposable income only in the sectors of general government, households and non-profit institutions serving households. For households, it holds that disposable income is increased by social transfers in kind provided by the government and non-profit sectors, whose disposable income is reduced by these social transfers in kind.

Final consumption expenditure for the sectors of households, non-profit institutions serving households and government represents the value of goods used for satisfaction of human needs regardless whether these needs are individual or collective. Expenditures on final consumption of households are increased by social transfers in kind obtained by this

sector from the sectors of general government and non-profit institutions serving households. Then we refer to so-called current final consumption (expenditure). In the government sector, the actual final consumption corresponds to expenditures on collective final consumption. The current final consumption of non-profit institutions equals zero. In the sectors of non-financial corporations and financial corporations, there is no final consumption, only intermediate consumption (Lindner, 2012).

### **Investment**

In the case of investment, the differences between the sectors are not as prominent (European Commission, 2020). Investment (gross capital formation) comprise gross fixed capital formation, change in inventories and net acquisition of valuables. Of cardinal importance is investment in fixed capital formation (frequently and commonly referred to as investment for the sake of simplicity). In the household sector, the gross (fixed) capital formation only includes acquisition of houses and flats. Households generate no inventories.

### **Net lending/net borrowing**

Net lending/net borrowing represents the balance on the non-financial account (or capital account, non-financial asset acquisition account) and the balance of the financial account. As such, it expresses the creditor or debtor position of the sector or the national economy as a whole towards other entities, i.e., other entities (sector(s)) in the domestic economy or non-residents (Spěvák, 2006).

Net lending/net borrowing equals the sum of the current account and capital account of the balance of payments. Since the importance of the capital account is usually low, the analysis abstracts away from it. It holds for the balance of payments current account that it equals the difference between saving and investment. Very inaccurately speaking, the analysis from the sectoral perspective focuses on “sectoral current accounts”, which may be a loose continuation of the approach of Feldstein and Horioka (1980), who focused on saving and investment in the whole national economy.

## **2 Methodology and empirical analysis**

This chapter has two parts. In the first subchapter we focus on the methodology and then follow empirical verification.

## 2.1 Methodology concept and basic research hypothesis

We chose panel regression, which can generally be noted as (Brooks, 2014):

$$y_{it} = \alpha + \beta x_{it} + u_{it} \quad (1)$$

where  $y_{it}$  is the dependent variable for the  $i$ -th unit at the time  $t$ ;  $x_{it}$  is the independent variable for the  $i$ -th unit at the time  $t$ ;  $u_{it}$  is the disturbance term for the  $i$ -th unit at the time  $t$ ;  $i = 1, 2, \dots, N$  and  $t = 1, 2, \dots, T$ .

Basically, we can most commonly come across two types of panel models: fixed-effects model and random-effects model. In order to identify the appropriateness of use of fixed or random effects, we apply the Hausman test, which will be carried out for each estimate.

For our purposes, the panel regression attains the form:

$$\left(\frac{I}{Y}\right)_{it} = \alpha + \beta \left(\frac{S}{Y}\right)_{it} + u_{it} \quad (2)$$

where  $I$  is gross capital formation (“investment”),  $S$  is gross national saving (“saving”) and  $Y$  is the product.

The basic estimate hypothesis tested, analogously to Feldstein and Horioka (1980), is:

- $H_0$ : capital is absolutely immobile between sectors and/or economies, i.e., the constant = 0 and, at the same time, the regression parameter = 1.
- $H_1$ : capital is at least partially mobile, i.e., the constant  $\neq 0$  and, at the same time, the regression parameter  $\neq 1$  and therefore, the intertemporal view of budgetary constraint of the analysed sector or the intertemporal view of budgetary constraint of the economy as a whole (i.e., intertemporal view of balance of payments<sup>3</sup>) cannot be neglected.

Stationarity was verified using the usual tests – most of the tests confirmed stationarity for all the time series at the 5% significance level. In this paper, the relationship between the level of investment and saving will be tested separately for each sector for the EU28 set of countries. The data are obtained from Eurostat, annual data frequency, period 1995–2018. This short period is chosen due to data availability.

## 2.2 Empirical analysis

This section presents four estimates for individual sectors of the national economy. First, a table of panel regression result is presented, followed by a brief comment on the result.

---

<sup>3</sup> See Baxter and Crucini (1993) and Obstfeld and Rogoff (1995).

**Table 1: Non-financial corporation sector S.11 (1995–2018) - Fixed-effects model**

| Dependent variable | Independent variable | Parameter | Standard error | t-statistics | p-value |
|--------------------|----------------------|-----------|----------------|--------------|---------|
| <i>I</i> _11       | <i>CONS</i>          | 12.169    | 0.463          | 26.299       | 0.000   |
|                    | <i>S</i> _11         | 0.097     | 0.036          | 2.737        | 0.006   |

Note: *I*\_11 = gross capital formation of non-financial corporation sector, *CONS* = constant, *S*\_11 = gross saving of non-financial corporation sector, number of observations 631, adjusted R<sup>2</sup> = 0.534, F-stat = 27.746 (0.000), panel regression with fixed effects (for countries)

Source: Eurostat, own calculations

From the point of view of the basic hypothesis, the non-financial corporation sector shows mobility of capital between sectors and/or between residents (sector S.11) and non-residents. The reason for the low regression parameter may be the method of saving formation, which proceeds over several periods, while investment is typically made in a single period. The panel regression used better captures this discrepancy between the “flow” and “stock” perspectives of the difference from a cross-section analysis based on average values for the selected period (see Feldstein and Horioka, 1980).<sup>4</sup>

**Table 2: Financial corporation sector S.12 (1995–2018) - Fixed-effects model**

| Dependent variable | Independent variable | Parameter | Standard error | t-statistics | p-value |
|--------------------|----------------------|-----------|----------------|--------------|---------|
| <i>I</i> _12       | <i>CONS</i>          | 0.560     | 0.024          | 23.417       | 0.000   |
|                    | <i>S</i> _12         | 0.025     | 0.009          | 2.837        | 0.005   |

Note: *I*\_12 = gross capital formation of financial corporation sector, *CONS* = constant, *S*\_12 = gross saving of financial corporation sector, number of observations 631, adjusted R<sup>2</sup> = 0.223, F-stat = 7.697 (0.000), panel regression with fixed effects (for countries)

Source: Eurostat, own calculations

The Hausman test admittedly demonstrated the appropriateness of use of the random-effects model for the countries. However, according to Brooks (2014) and Wooldridge (2009), the random-effects model is preferred for units that have been selected randomly into the estimate, which is not common. That is why Wooldridge (2009) recommends estimating both types of effects and he is more inclined to a fixed-effects model for empirical analyses. Therefore, we will calculate the fixed-effect model for this and the other estimates, although the Hausman test “recommended against” it.

From the point of view of the basic hypothesis, the financial corporation sector shows mobility of capital between sectors and/or between residents (sector S.12) and non-residents. In addition to the influence of the low investment activity and saving formation (see Figure 1), the estimated model reflects one of the basic functions of financial institutions as a

<sup>4</sup>This argumentation can be used for the other sectors too.

mediator between the surplus (i.e., saving-forming) and the deficit (i.e., investment-forming) units; see, e.g., the low value of the constant in the estimate.

**Table 3: General government sector S.13 (1995–2018) - Fixed-effects model**

| Dependent variable | Independent variable | Parameter | Standard error | <i>t</i> -statistics | p-value |
|--------------------|----------------------|-----------|----------------|----------------------|---------|
| <i>I</i> _13       | <i>CONS</i>          | 3.613     | 0.043          | 84.675               | 0.000   |
|                    | <i>S</i> _13         | 0.039     | 0.015          | 2.579                | 0.010   |

Note: *I*\_13 = gross capital formation of general government sector, *CONS* = constant, *S*\_13 = gross saving of general government sector, number of observations 644, adjusted  $R^2 = 0.413$ , F-stat = 17.130 (0.000), panel regression with fixed effects (for countries)

Source: Eurostat, own calculations

From the point of view of the basic hypothesis, the general government sector shows mobility of capital between sectors and/or between residents (sector S.13) and non-residents. From the economic point of view, the result reflects the actual state of the government sector in the studied countries. Upon consulting any general macroeconomic database (Eurostat), it is evident that a government does not have to form sufficient saving for investment formation. One of the reasons may be financing from other sectors of the economy in question (see, e.g., purchases of government bonds by the financial corporation sector) or from abroad (see, e.g., purchases of government bonds of peripheral EU countries by advanced EU economies). The frequently very low saving in the general government sector is reflect by a high rate of consumption, which logically follows from what we said in the part dealing with national accounts, and trouble-free (co-)financing of some investment from both domestic and European funds.

**Table 4: Sectors households and non-profit institutions serving households S.14 and S.15 (1995–2018) - Fixed-effects model**

| Dependent variable | Independent variable | Parameter | Standard error | <i>t</i> -statistics | p-value |
|--------------------|----------------------|-----------|----------------|----------------------|---------|
| <i>I</i> _14-5     | <i>CONS</i>          | 4.338     | 0.152          | 28.633               | 0.000   |
|                    | <i>S</i> _14-5       | 0.186     | 0.025          | 7.367                | 0.000   |

Note: *I*\_14-5 = gross capital formation of sector households and non-profit institutions serving households, *CONS* = constant, *S*\_14-5 = gross saving of sector households and non-profit institutions serving households, number of observations 631, adjusted  $R^2 = 0.501$ , F-stat = 24.419 (0.000), panel regression with fixed effects (for countries)

Source: Eurostat, own calculations

From the point of view of the basic hypothesis, the sectors households and non-profit institutions serving households show mobility of capital between sectors and/or between residents (sectors S.14 and S.15) and non-residents. In this estimate, the regression coefficient is the highest of all the sectors analysed. The input data for saving and investment generally



indicates lower formation of saving and higher investment activity before the global financial crisis (or Eurozone crisis) and opposite behaviour of households after the crisis. Since the main investment activities of households are connected with purchases of houses and flats (abstracting from non-profit organisations due to their low proportion in the sample), determinants explaining investment activity of households may include conditions on the credit market (particularly the mortgage market).

## **Conclusion**

The author's analysis is grounded in the approach of Feldstein and Horioka (1980), who studied the relationship between investment and saving at the aggregate level. Compared to the original approach, the analysis was made at the level of different sectors of the national economy using panel regression. The surprising result was the low values of regression parameters, i.e., change in saving leading to only a slight change in investment. The reason for the low sensitivity of investment to change in saving may be the actual logic of saving formation over several periods and investment usually being made in a single period. However, this type of analysis does not capture the "stock" perspective appropriately enough. A suitable addition would be an estimate using cross-sectional regression, which would use average saving and investment values for the study period. A shortcoming of the model from the statistics point of view is the inclusion of a single independent variable, namely the gross savings in different sectors. The results might have more information value if additional variables were included.

Another question is financing of investment itself. If investment is financed not only by "actual" saving but also credit generated "ex nihilo", the seemingly firm relationship between investment and saving may be a lot less fixed. However, this goes beyond the focus of the paper and the fundamental logic of Feldstein and Horioka (1980), and will serve as another option for extending this type of analysis.

## **Acknowledgment**

The paper is produced with support from project F1/03/2020 Dynamika finančních a ekonomických veličin v kontextu vnější rovnováhy.

## References

- Barro, R. J. (1974). Are Government Bonds Net Wealth? *Journal of Political Economy*, 82(6), 1095–1117, <https://doi.org/10.1086/260266>
- Baxter, M., Crucini, M. J. (1993). Explaining Saving--Investment Correlations. *The American Economic Review*, 83(3), 416–436. <https://www.jstor.org/stable/2117526?seq=1>
- Brooks, C. (2014). *Introductory Econometrics for Finance*. 3rd Edition, Cambridge: Cambridge University Press, <https://doi.org/10.1017/CBO9781139540872>
- Český statistický úřad (ČSÚ) (2015). *European system of accounts* ESA 2010.
- Eurostat (2013). *European system of accounts - ESA 2010*. <https://ec.europa.eu/eurostat/documents/3859598/5925693/KS-02-13-269-EN.PDF/44cd9d01-bc64-40e5-bd40-d17df0c69334>
- European Commission (2020). *AMECO*. [https://ec.europa.eu/economy\\_finance/ameco/user/serie/SelectSerie.cfm](https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm)
- Feldstein, M., Horioka, C. (1980). Domestic Saving and International Capital Flows. *Economic Journal*, 90(358), 314–329, <https://doi.org/10.2307/2231790>
- Hronová, S., et al. (2019). *Národní účetnictví. Od výroby k bohatství*. ISBN 978-80-7400-738-5.
- Lindner, F. (2012). *Saving does not finance Investment: Accounting as an indispensable guide to economic theory*. Institut für Makroökonomie und Konjunkturforschung. Düsseldorf Working Paper No. 100-2012.
- Obstfeld, M., Rogoff, K. (1995). The Intertemporal Approach to the Current Account, in Grossman, G. M., Rogoff, K., eds., *Handbook of International Economics*, pp. 1731–1799.
- Obstfeld, M., Rogoff, K. (2001). The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?, in Bernanke, B. S., Rogoff, K., eds., *NBER Macroeconomics Annual 2000*, pp. 339–412.
- Pánková, V. (2016). Current Account, Consumption and Capital Mobility: An Econometric Approach. *Prague Economic Papers*, 25(6), 742–753, <https://doi.org/10.18267/j.pep.585>
- Spěváček, V. (2006). Makroekonomická rovnováha české ekonomiky v letech 1995 až 2005. *Politická ekonomie*, 54(6), 742–761, <https://doi.org/10.18267/j.polek.581>
- Wooldridge, J. M. (2009). *Introductory Econometrics: A Modern Approach*. 5th Edition, Mason: South-Western Cengage Learning. ISBN 978-1-111-53104-1.

## Contact

Kateřina Šimová

Department of Monetary Theory and Policy, Faculty of Finance and Accounting, University of Economics, Prague

University of Economics, Prague, W. Churchill Sq. 4, 130 67 Prague, Czech Republic

[katerina.simova@vse.cz](mailto:katerina.simova@vse.cz)