



WIRTSCHAFTS
UNIVERSITÄT
WIEN VIENNA
UNIVERSITY OF
ECONOMICS
AND BUSINESS

Florentin GLOETZL
Armon REZAI

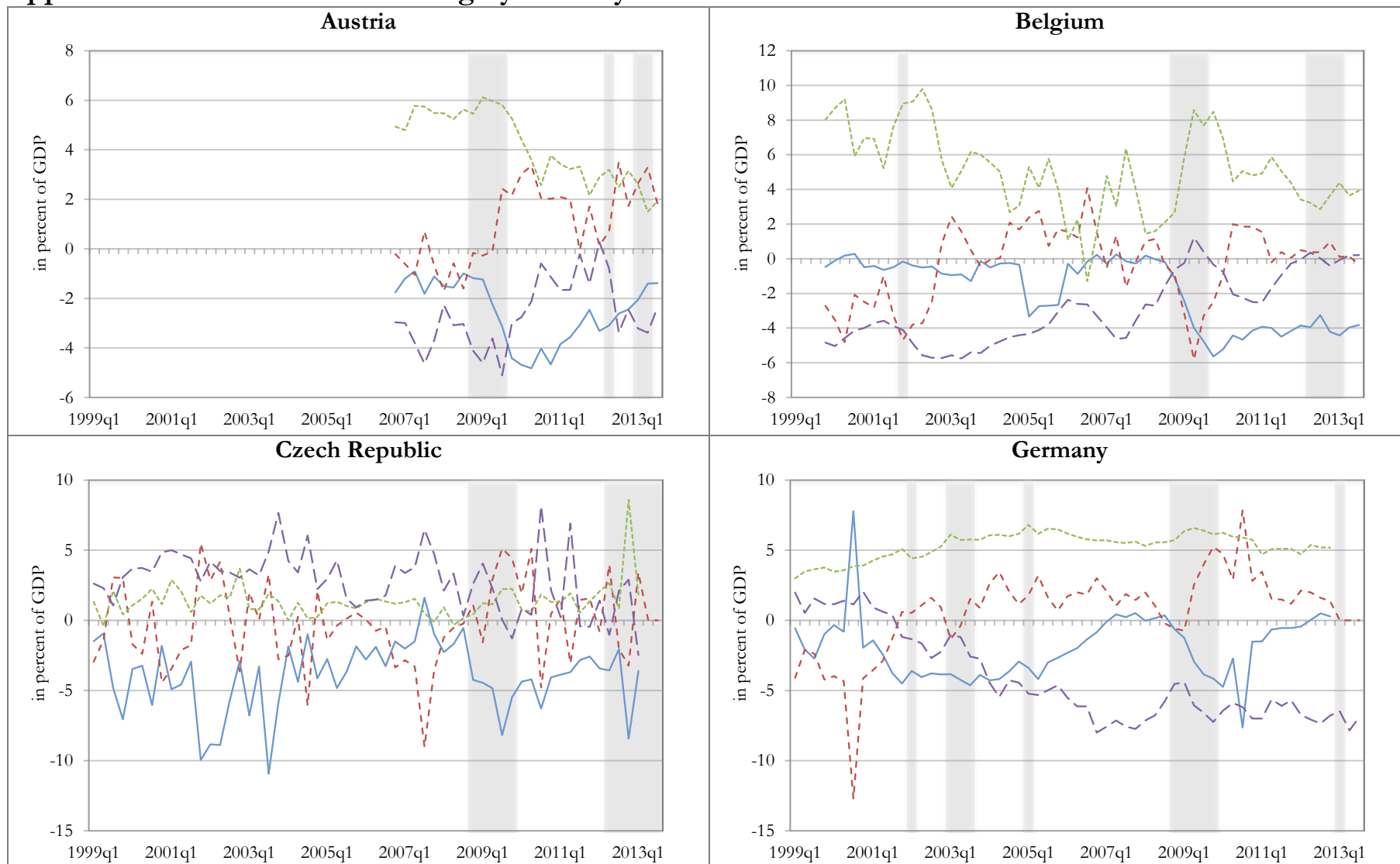
Appendix to
“A Sectoral Net Lending Perspective on Europe”

Working Paper Series
Nr. 14 / Year 3 / 2017

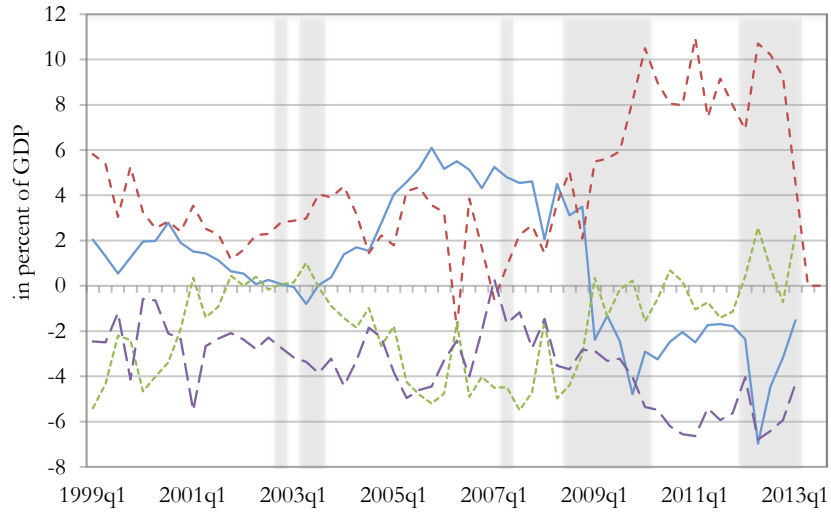
INSTITUTE FOR
ECOLOGICAL
ECONOMICS

Vienna University of
Economics and Business

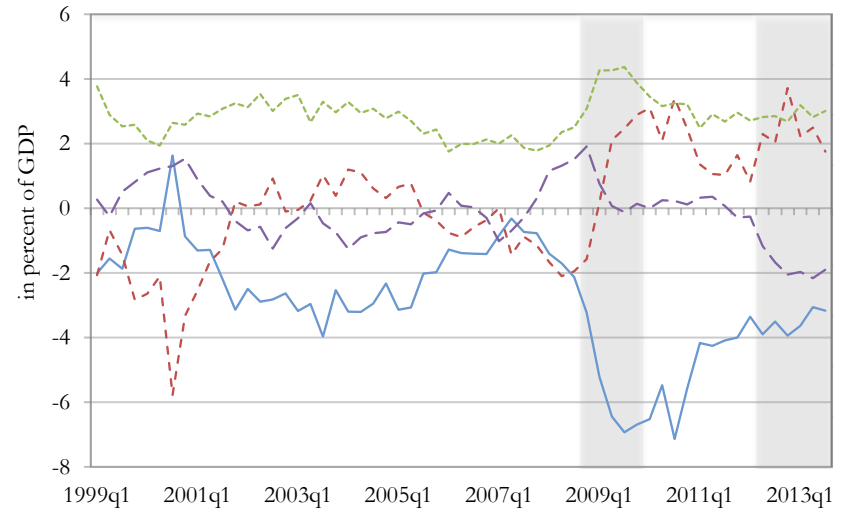
Appendix A – Sectoral Net Lending by Country



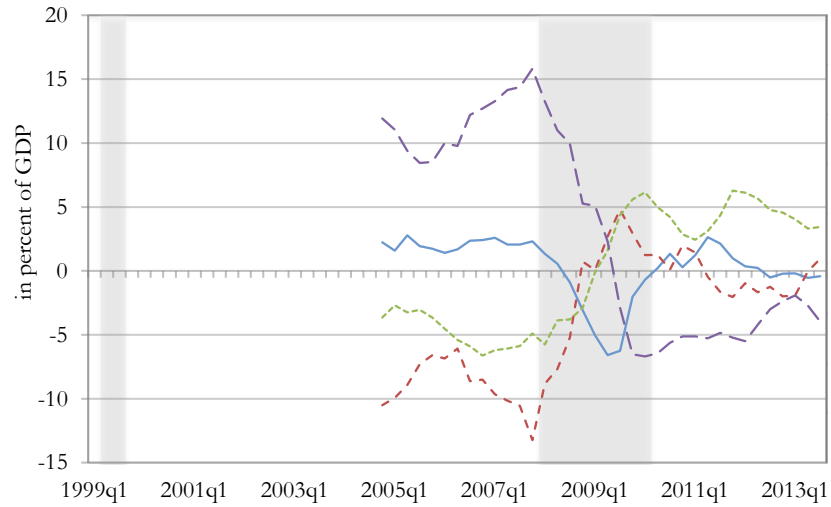
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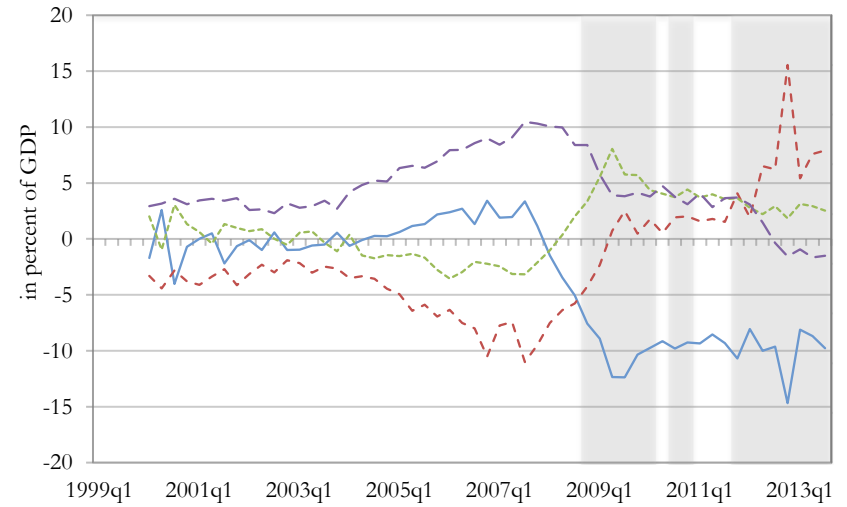
Euro Area (17)



Estonia

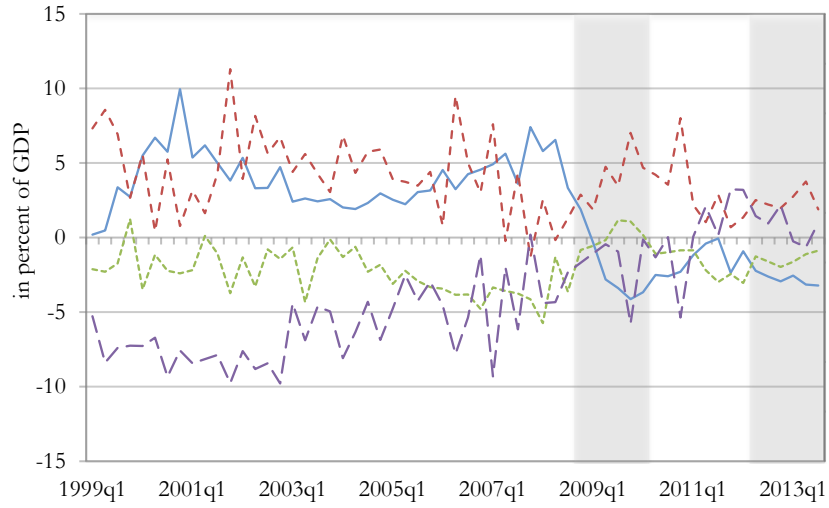


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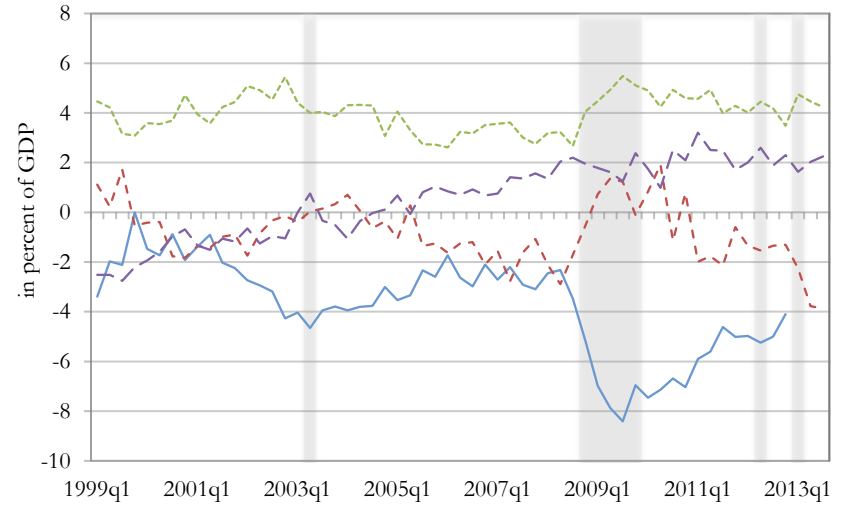


Recession Government Corporations Households Rest of the world

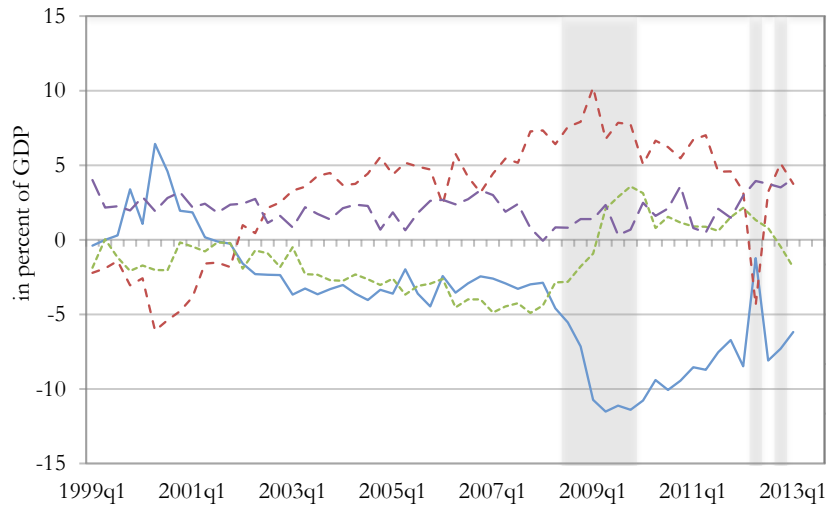
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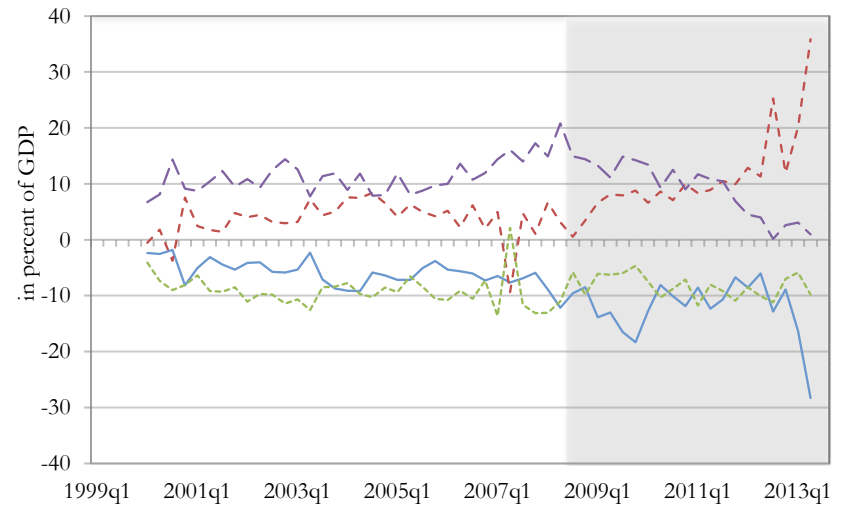
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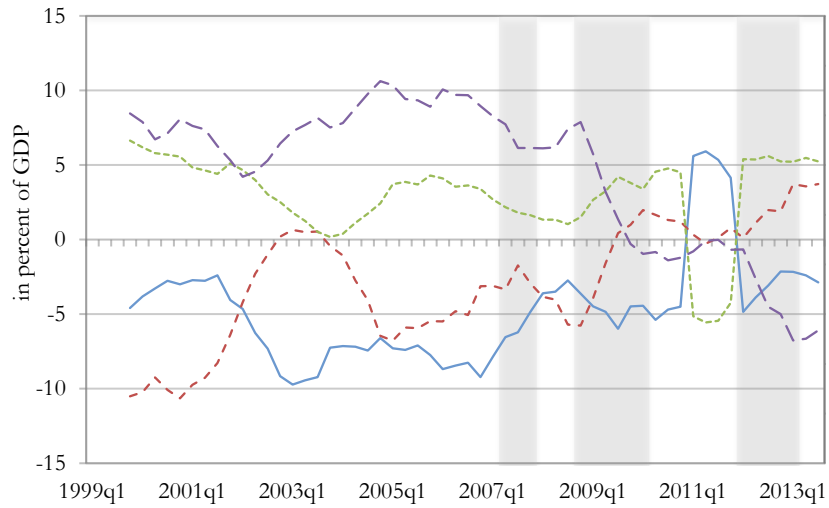


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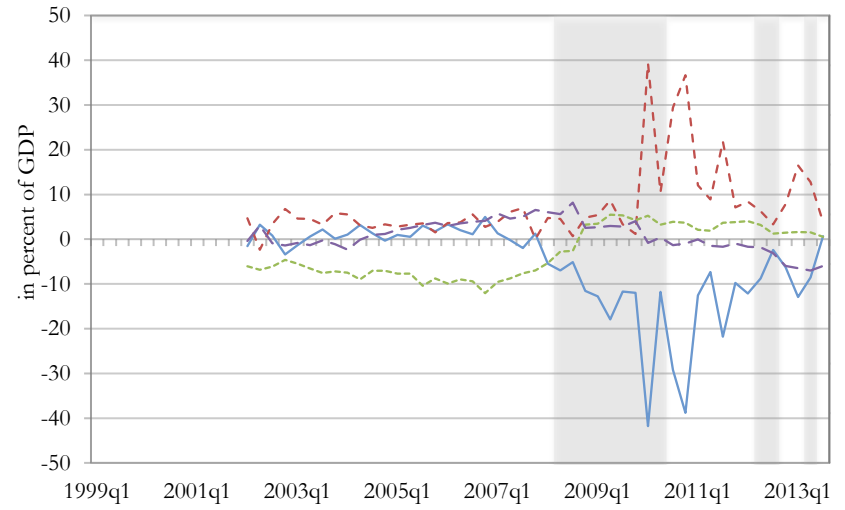


Recession Government Corporations Households Rest of the world

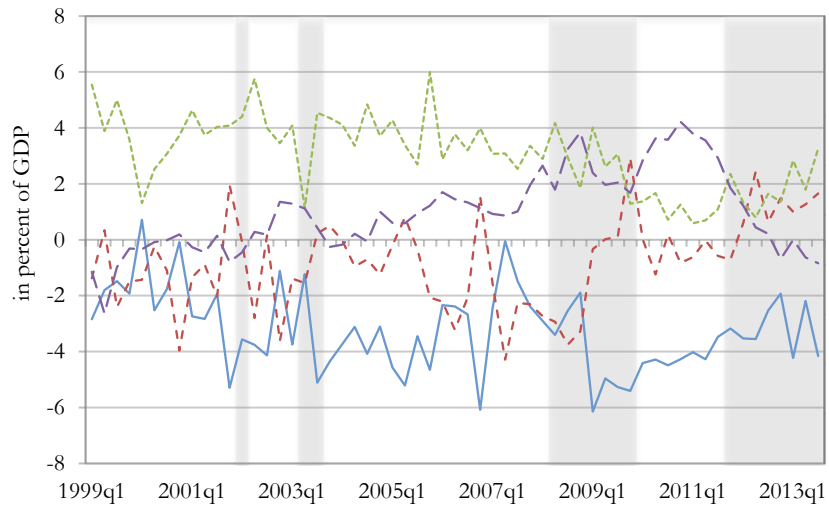
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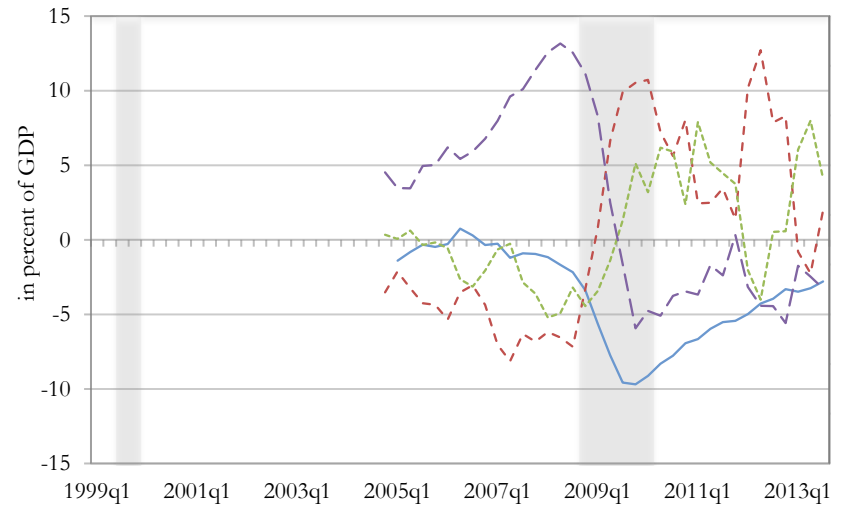
Ireland



Italy

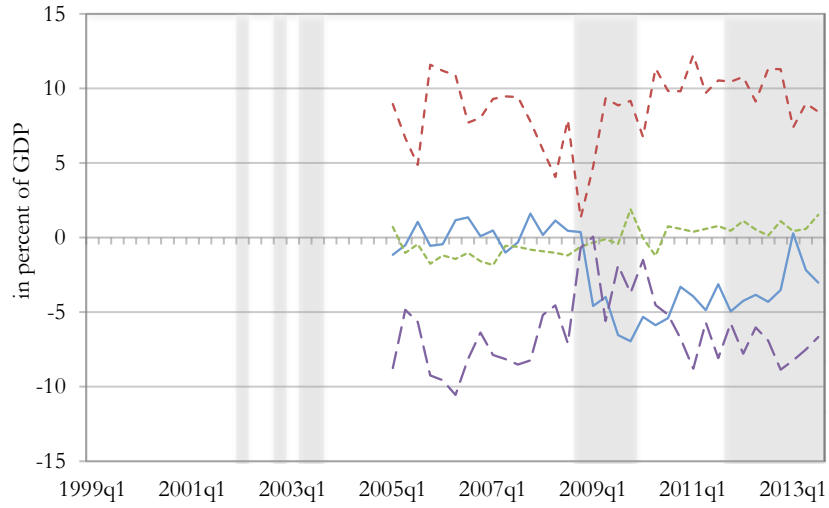


Lithuania

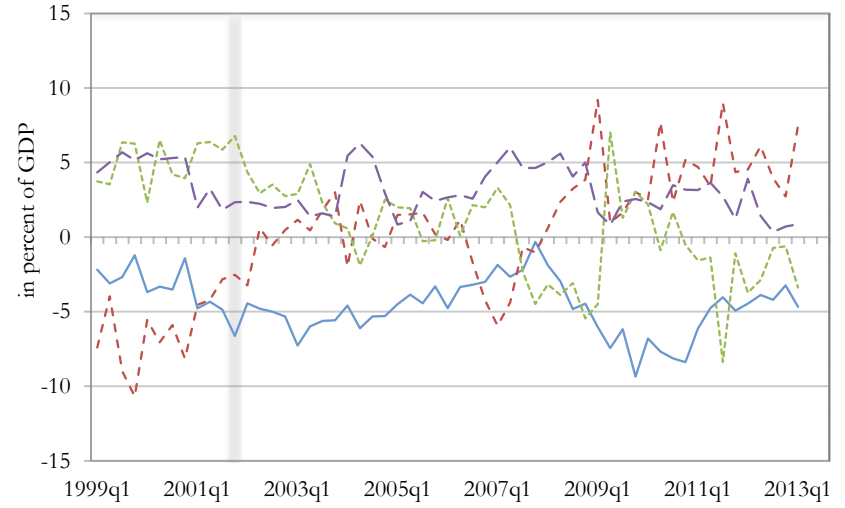


Recession Government Corporations Households Rest of the world

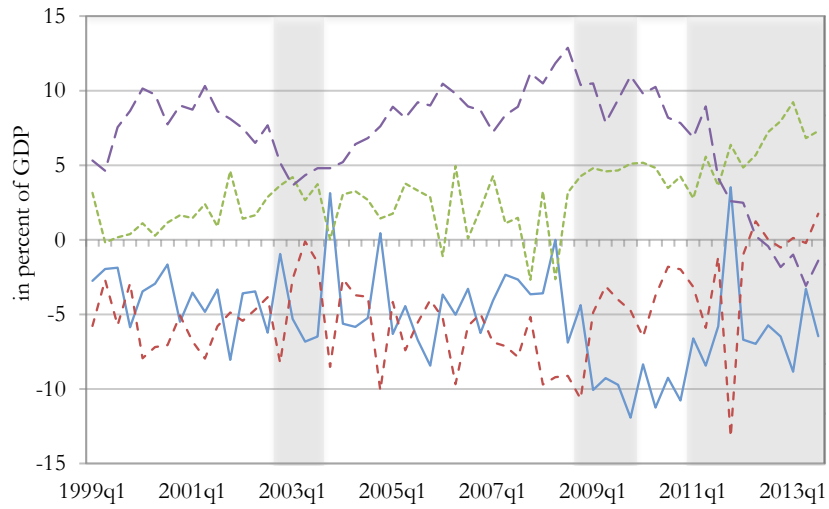
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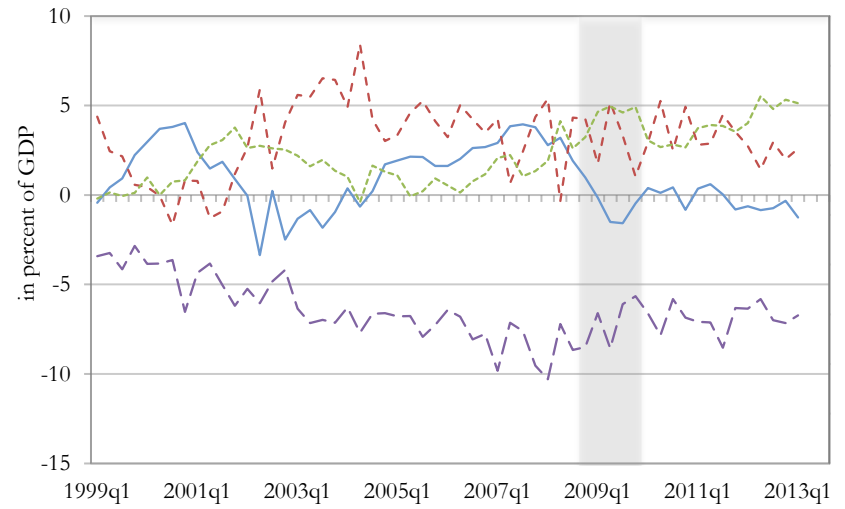
Poland



Portugal

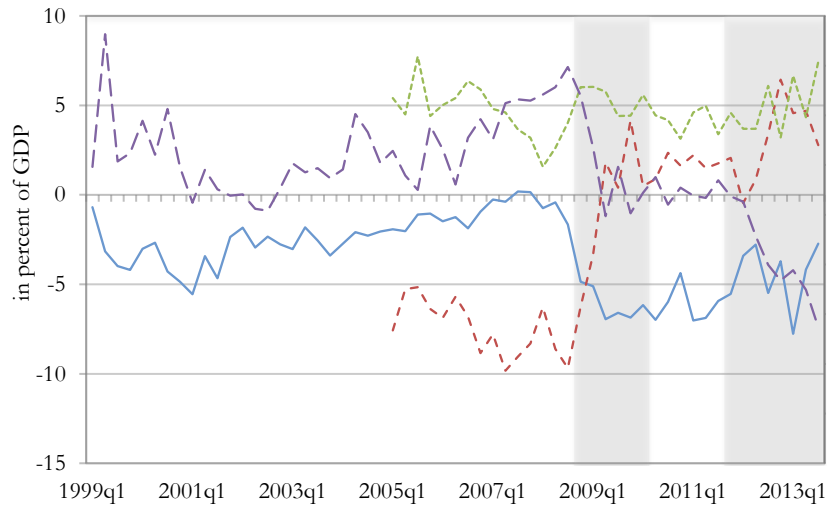


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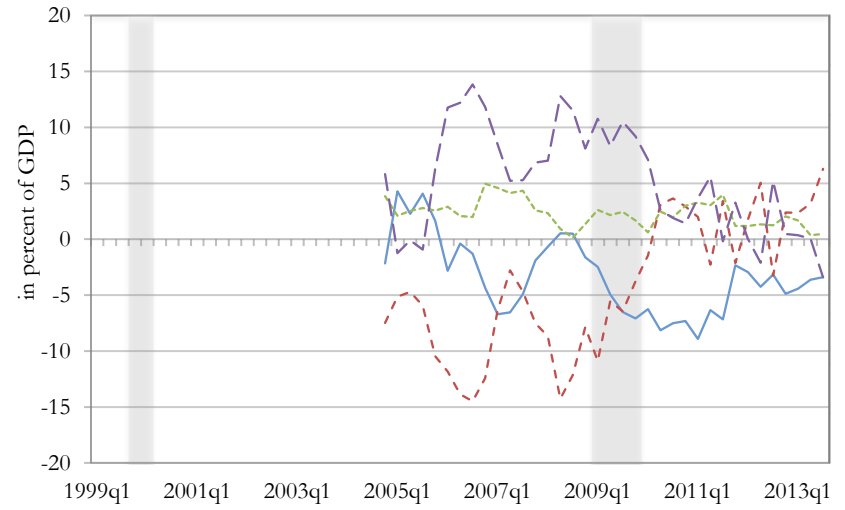


Recession Government Corporations Households Rest of the world

Slovenia

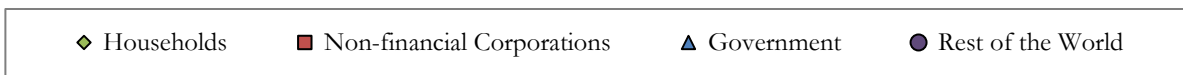
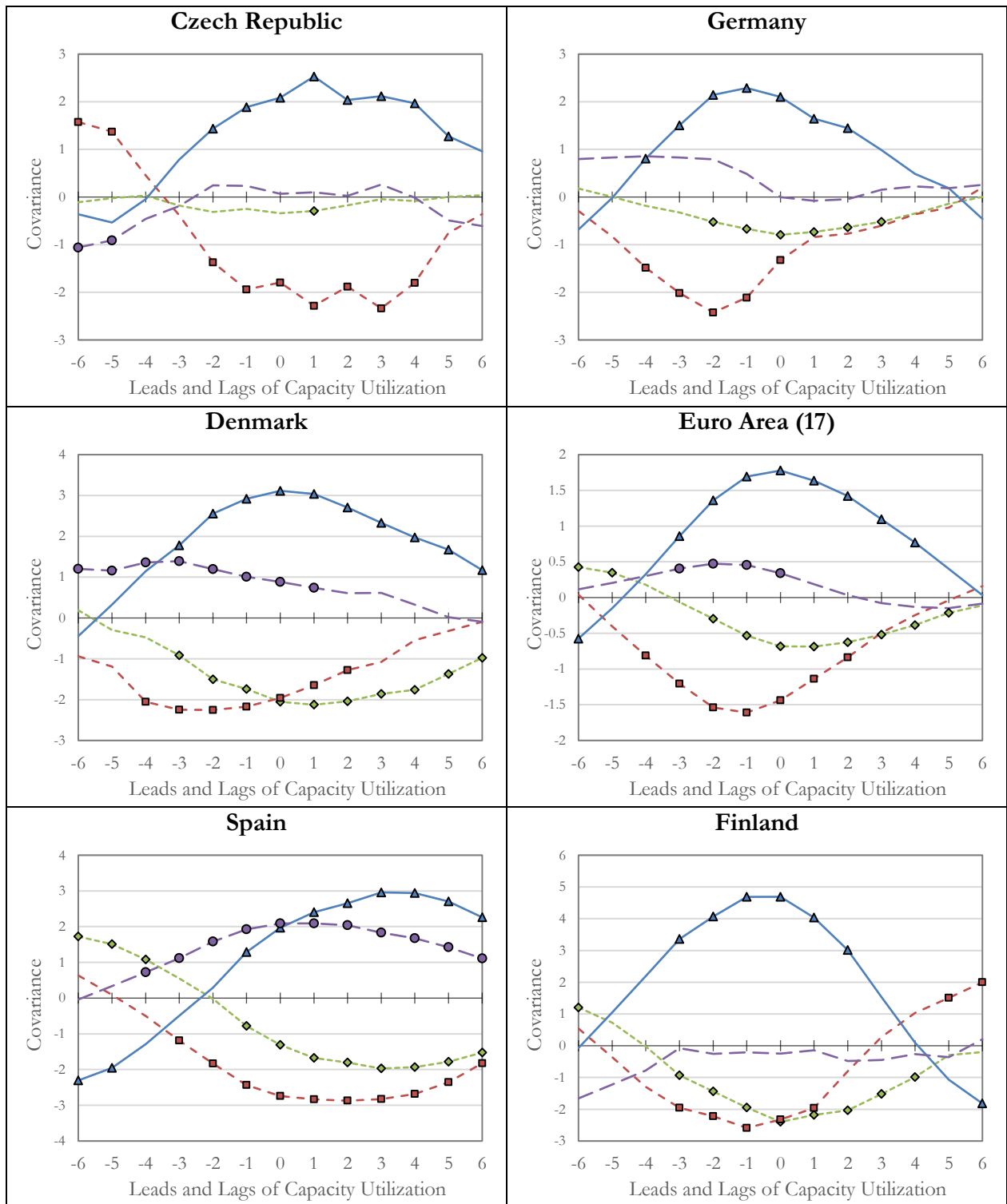


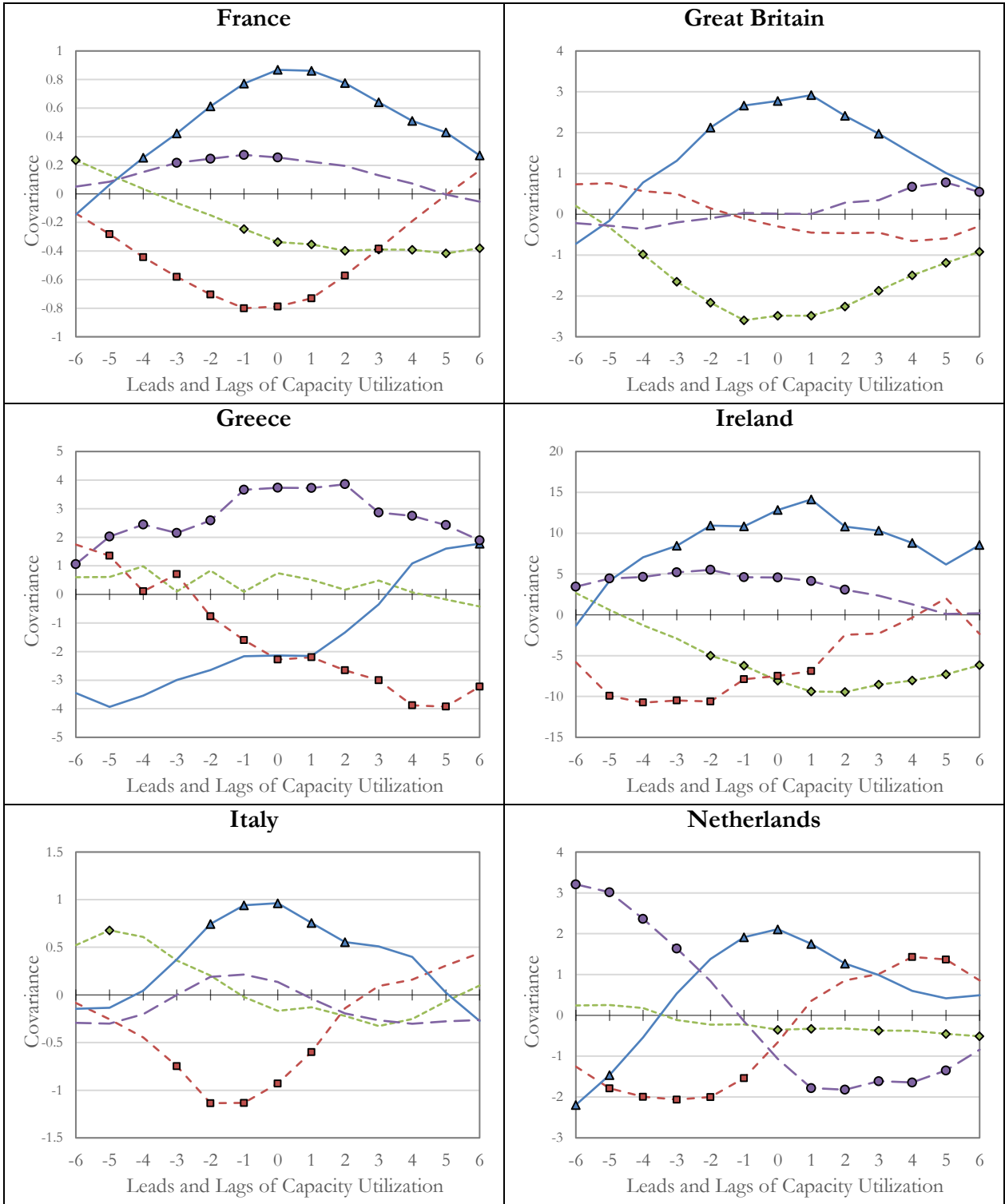
Slovakia



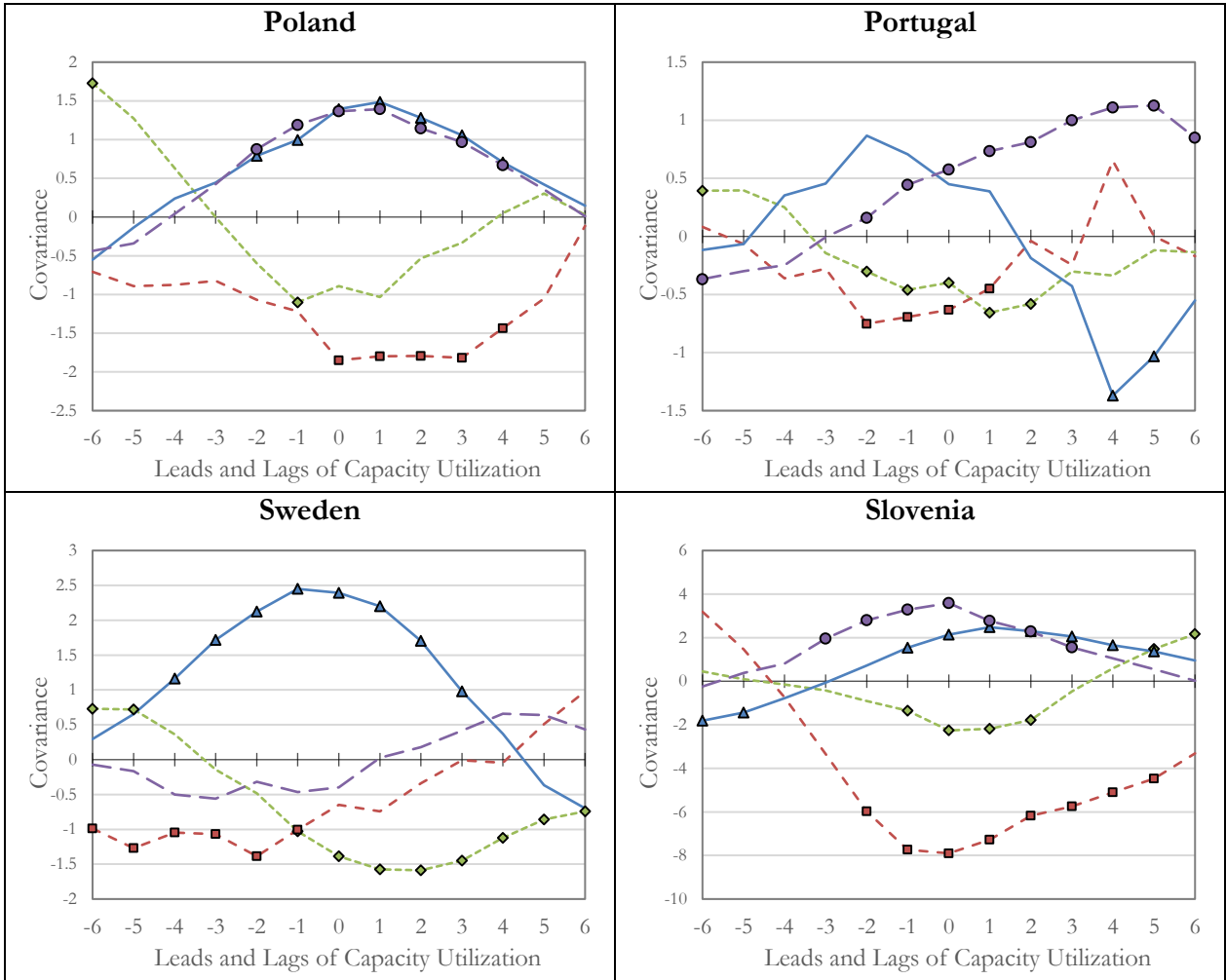
Recession Government Corporations Households Rest of the world

Appendix B - Sectoral Net Lending in the Business Cycle by Country

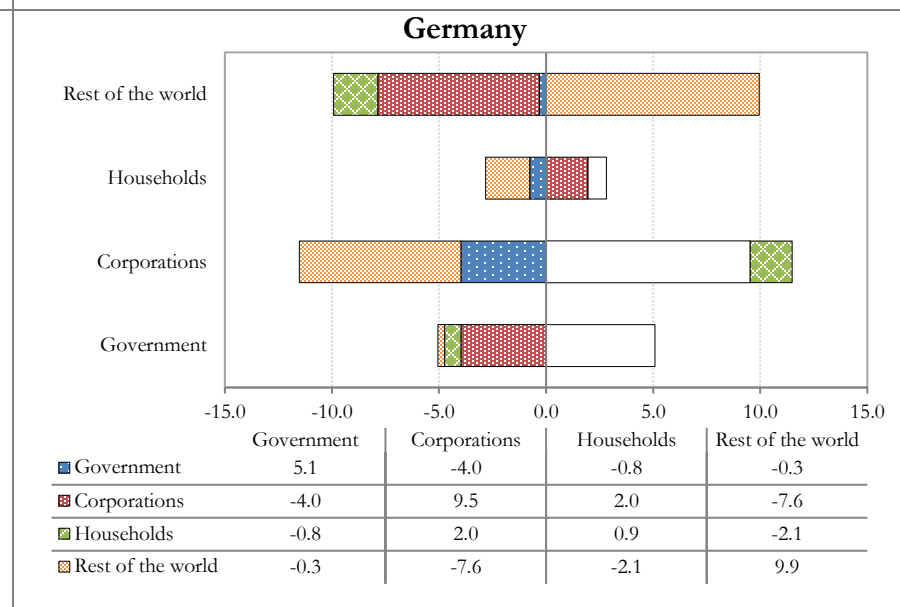
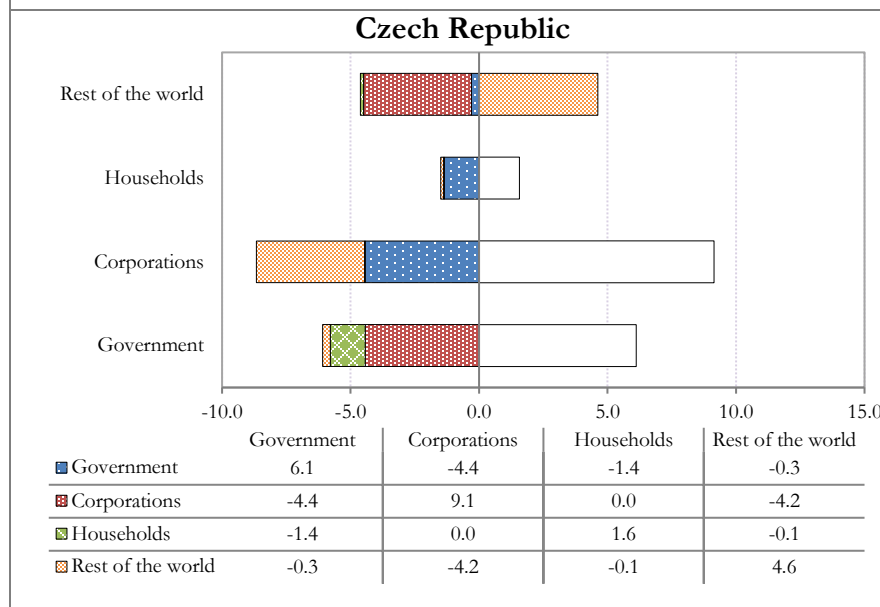
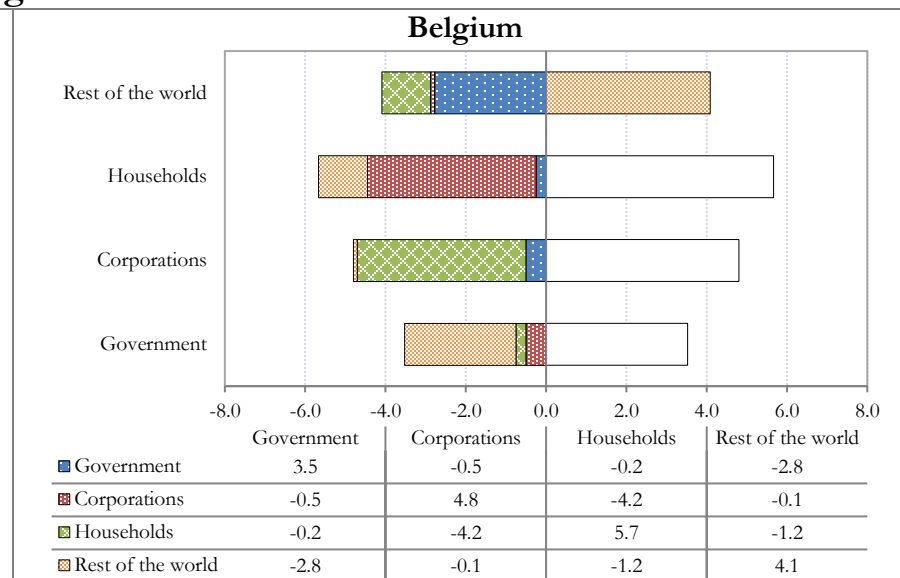
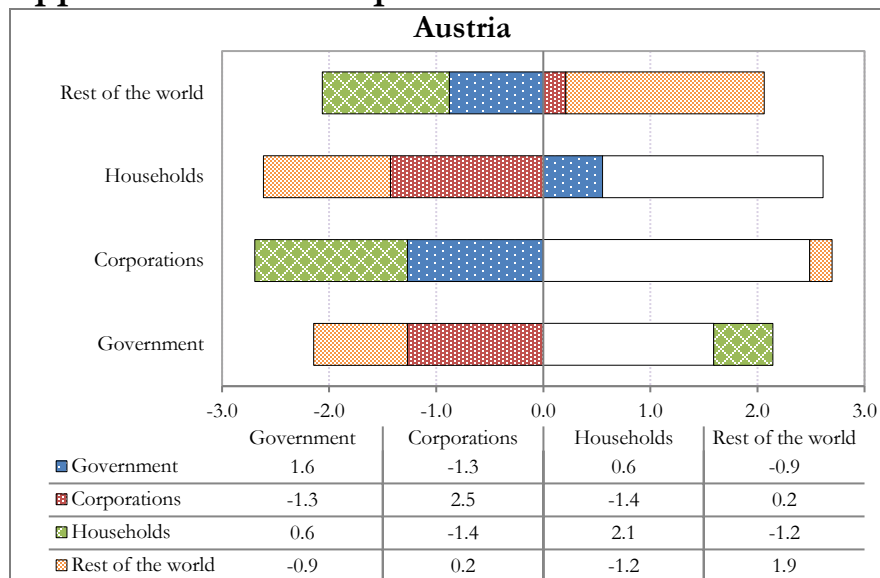




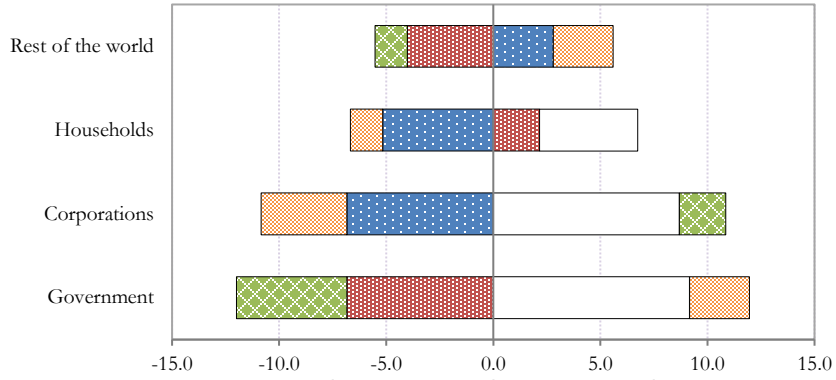
◆ Households ■ Non-financial Corporations ▲ Government ● Rest of the World



Appendix C – Decomposition of Sectoral Net Lending Variances

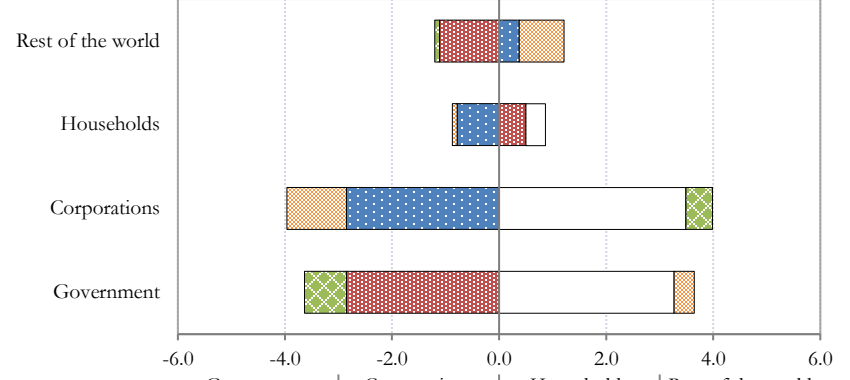


Denmark



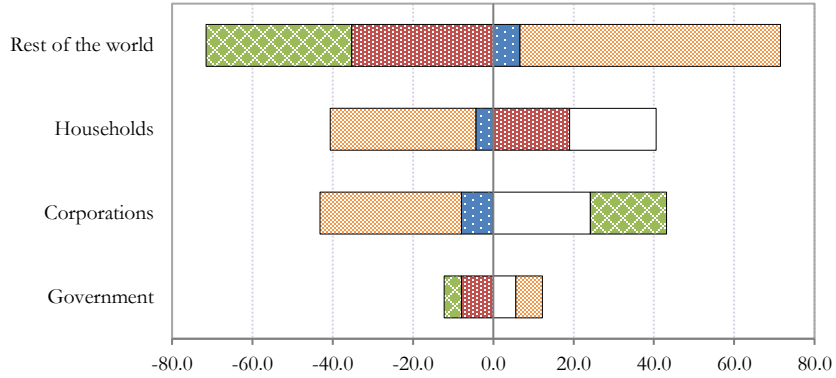
	Government	Corporations	Households	Rest of the world
Government	9.2	-6.8	-5.2	2.8
Corporations	-6.8	8.7	2.2	-4.0
Households	-5.2	2.2	4.6	-1.5
Rest of the world	2.8	-4.0	-1.5	2.8

Euro Area (17)



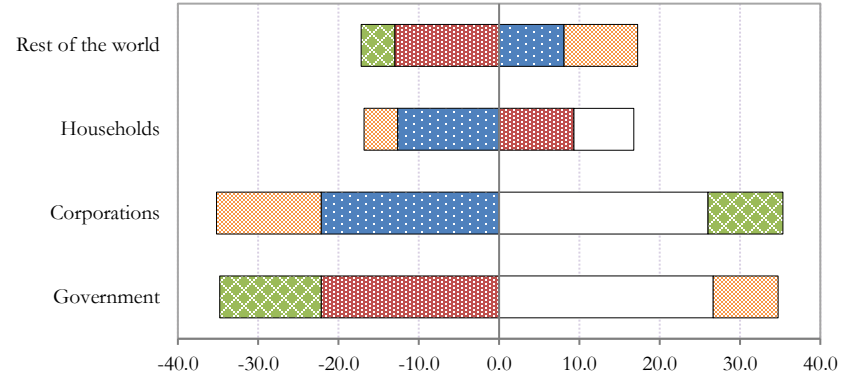
	Government	Corporations	Households	Rest of the world
Government	3.3	-2.9	-0.8	0.4
Corporations	-2.9	3.5	0.5	-1.1
Households	-0.8	0.5	0.4	-0.1
Rest of the world	0.4	-1.1	-0.1	0.8

Estonia



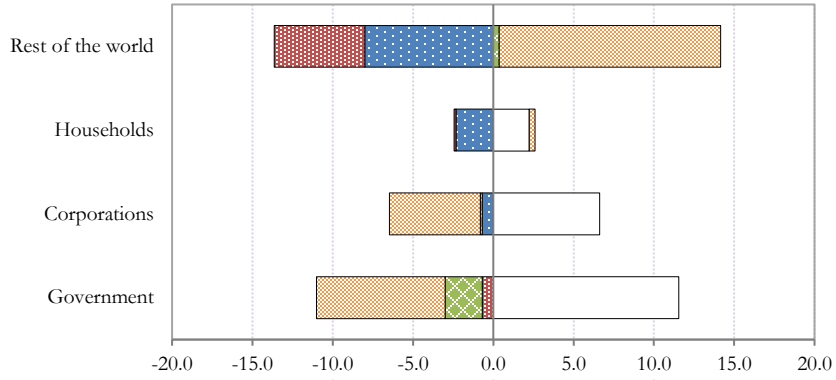
	Government	Corporations	Households	Rest of the world
Government	5.6	-7.9	-4.3	6.6
Corporations	-7.9	24.2	19.0	-35.3
Households	-4.3	19.0	21.5	-36.3
Rest of the world	6.6	-35.3	-36.3	64.9

Spain



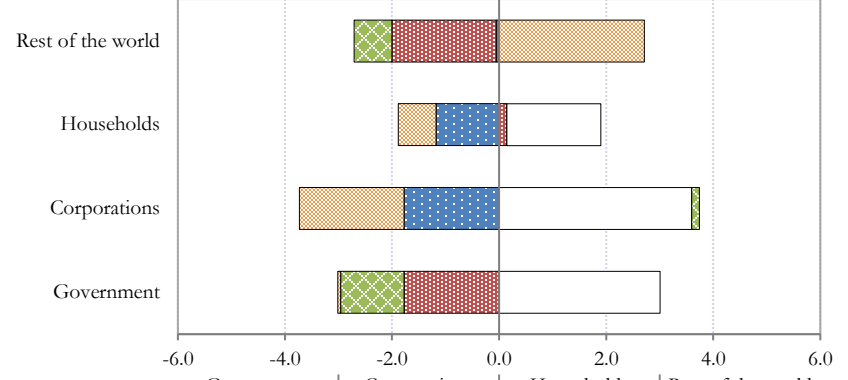
	Government	Corporations	Households	Rest of the world
Government	26.7	-22.2	-12.6	8.1
Corporations	-22.2	26.0	9.3	-13.0
Households	-12.6	9.3	7.5	-4.2
Rest of the world	8.1	-13.0	-4.2	9.2

Finland



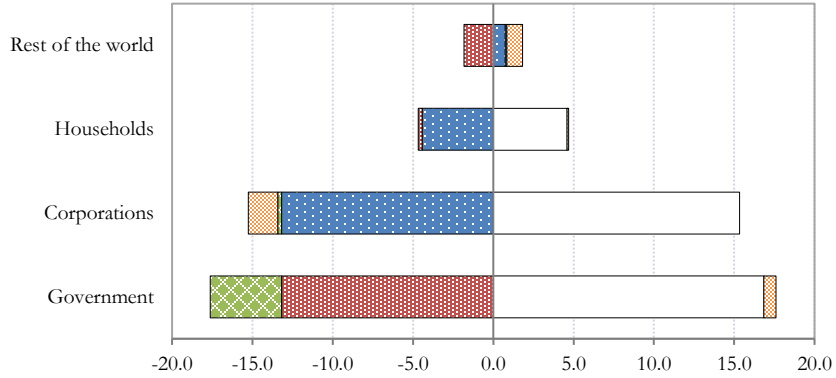
	Government	Corporations	Households	Rest of the world
Government	11.5	-0.7	-2.3	-8.0
Corporations	-0.7	6.6	-0.1	-5.7
Households	-2.3	-0.1	2.2	0.4
Rest of the world	-8.0	-5.7	0.4	13.8

France



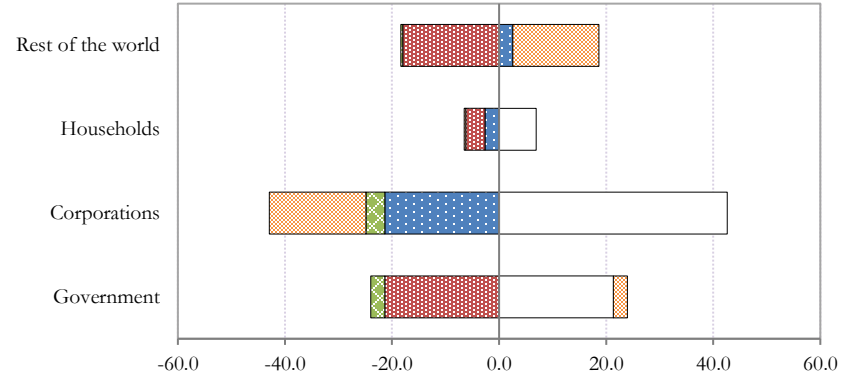
	Government	Corporations	Households	Rest of the world
Government	3.0	-1.8	-1.2	-0.1
Corporations	-1.8	3.6	0.1	-2.0
Households	-1.2	0.1	1.8	-0.7
Rest of the world	-0.1	-2.0	-0.7	2.7

Great Britain



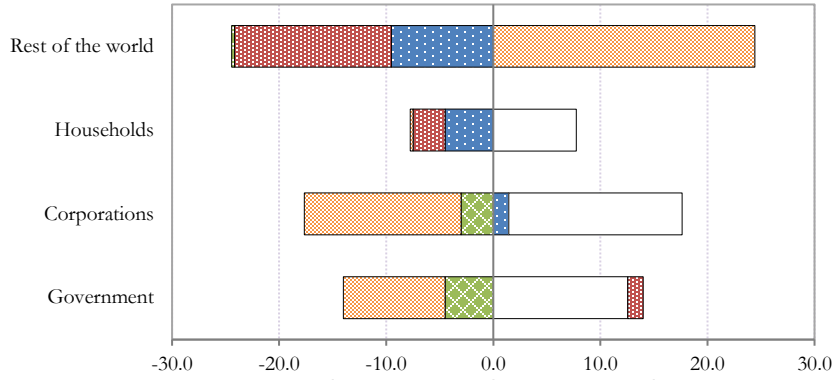
	Government	Corporations	Households	Rest of the world
Government	16.9	-13.2	-4.4	0.8
Corporations	-13.2	15.3	-0.2	-1.8
Households	-4.4	-0.2	4.6	0.1
Rest of the world	0.8	-1.8	0.1	1.0

Greece



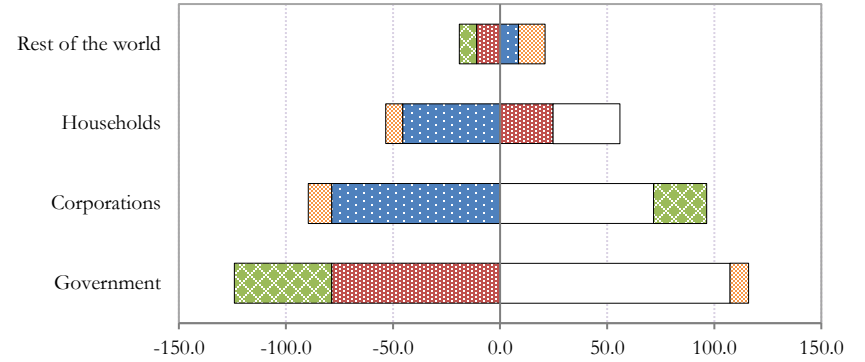
	Government	Corporations	Households	Rest of the world
Government	21.4	-21.3	-2.7	2.6
Corporations	-21.3	42.6	-3.5	-18.0
Households	-2.7	-3.5	6.9	-0.3
Rest of the world	2.6	-18.0	-0.3	16.0

Hungary



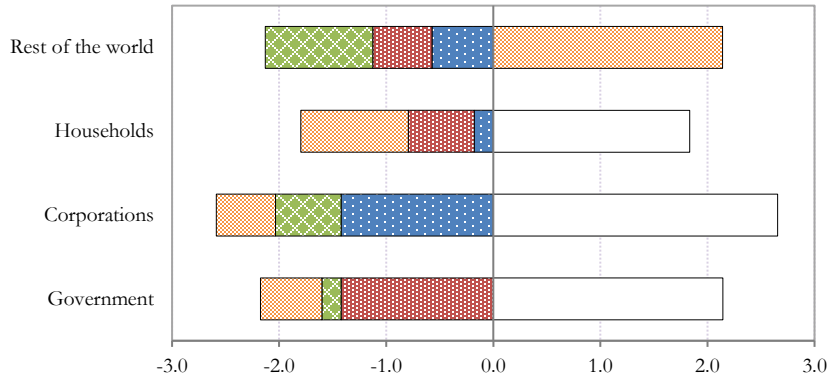
	Government	Corporations	Households	Rest of the world
Government	12.6	1.4	-4.5	-9.5
Corporations	1.4	16.2	-3.0	-14.6
Households	-4.5	-3.0	7.8	-0.3
Rest of the world	-9.5	-14.6	-0.3	24.4

Ireland



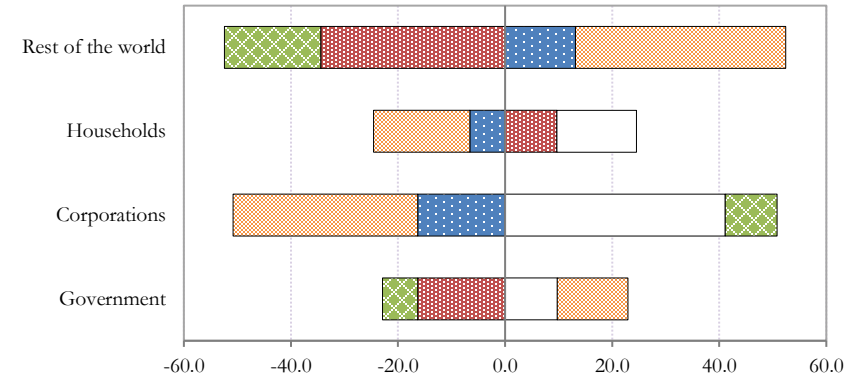
	Government	Corporations	Households	Rest of the world
Government	107.4	-78.6	-45.5	8.6
Corporations	-78.6	71.7	24.7	-11.0
Households	-45.5	24.7	31.2	-8.0
Rest of the world	8.6	-11.0	-8.0	12.4

Italy



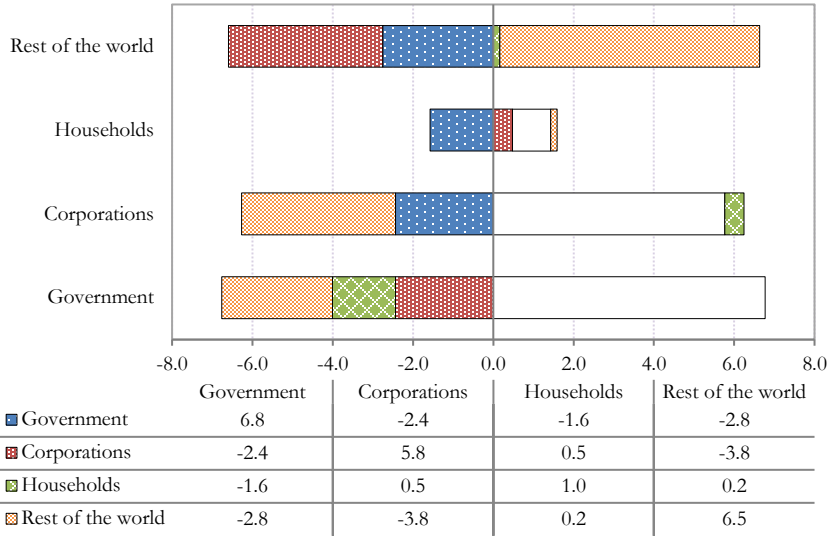
	Government	Corporations	Households	Rest of the world
Government	2.1	-1.4	-0.2	-0.6
Corporations	-1.4	2.7	-0.6	-0.6
Households	-0.2	-0.6	1.8	-1.0
Rest of the world	-0.6	-0.6	-1.0	2.1

Lithuania

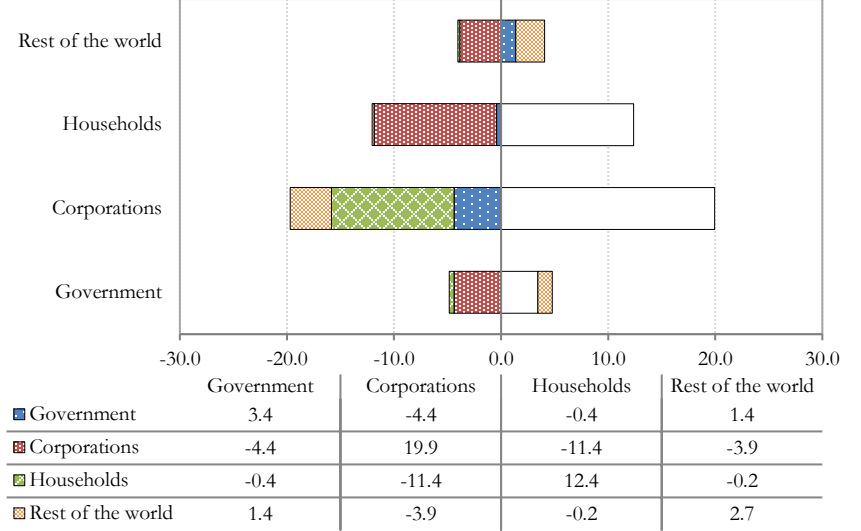


	Government	Corporations	Households	Rest of the world
Government	9.8	-16.3	-6.6	13.2
Corporations	-16.3	41.1	9.7	-34.5
Households	-6.6	9.7	14.9	-18.0
Rest of the world	13.2	-34.5	-18.0	39.3

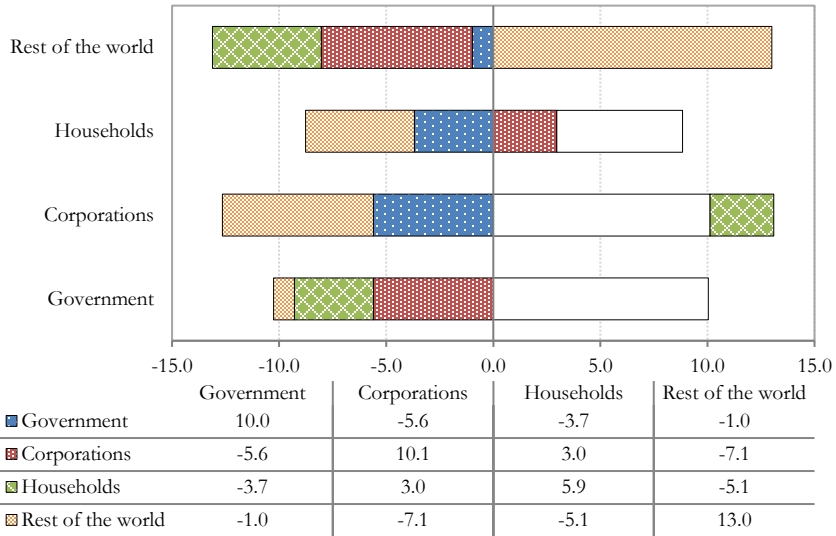
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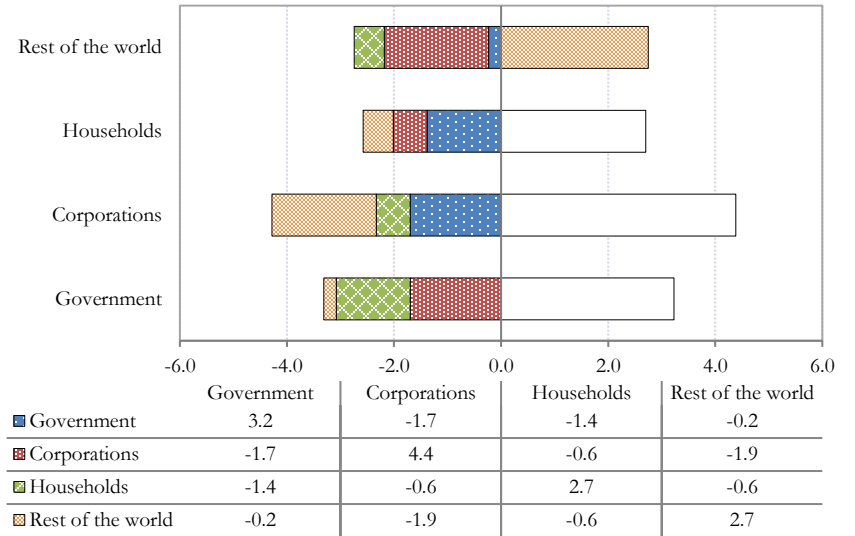
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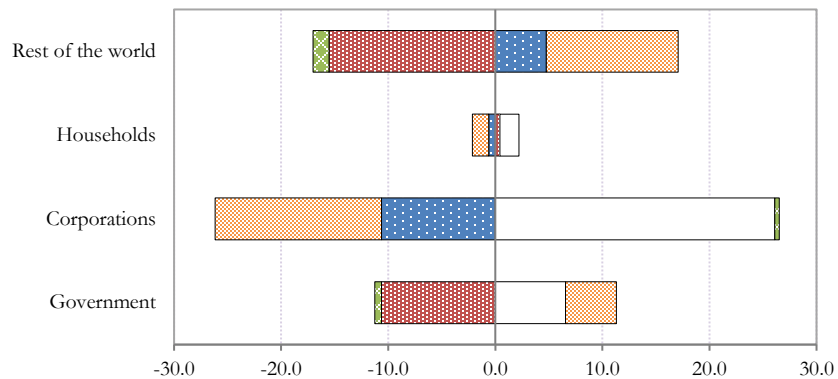
Portugal



Sweden

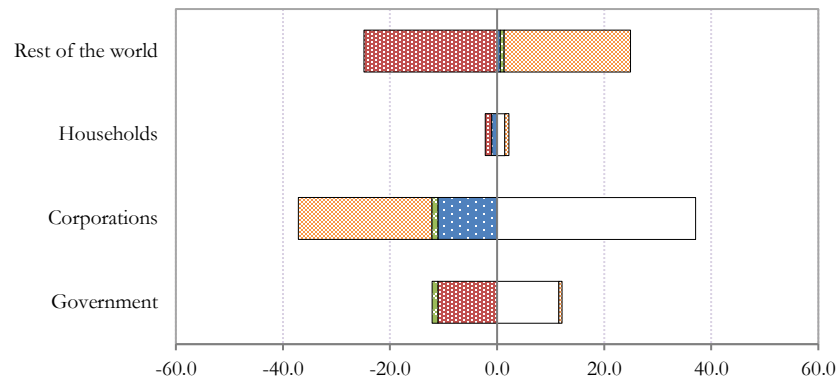


Slovenia



	Government	Corporations	Households	Rest of the world
Government	6.6	-10.6	-0.6	4.8
Corporations	-10.6	26.1	0.4	-15.5
Households	-0.6	0.4	1.8	-1.5
Rest of the world	4.8	-15.5	-1.5	12.3

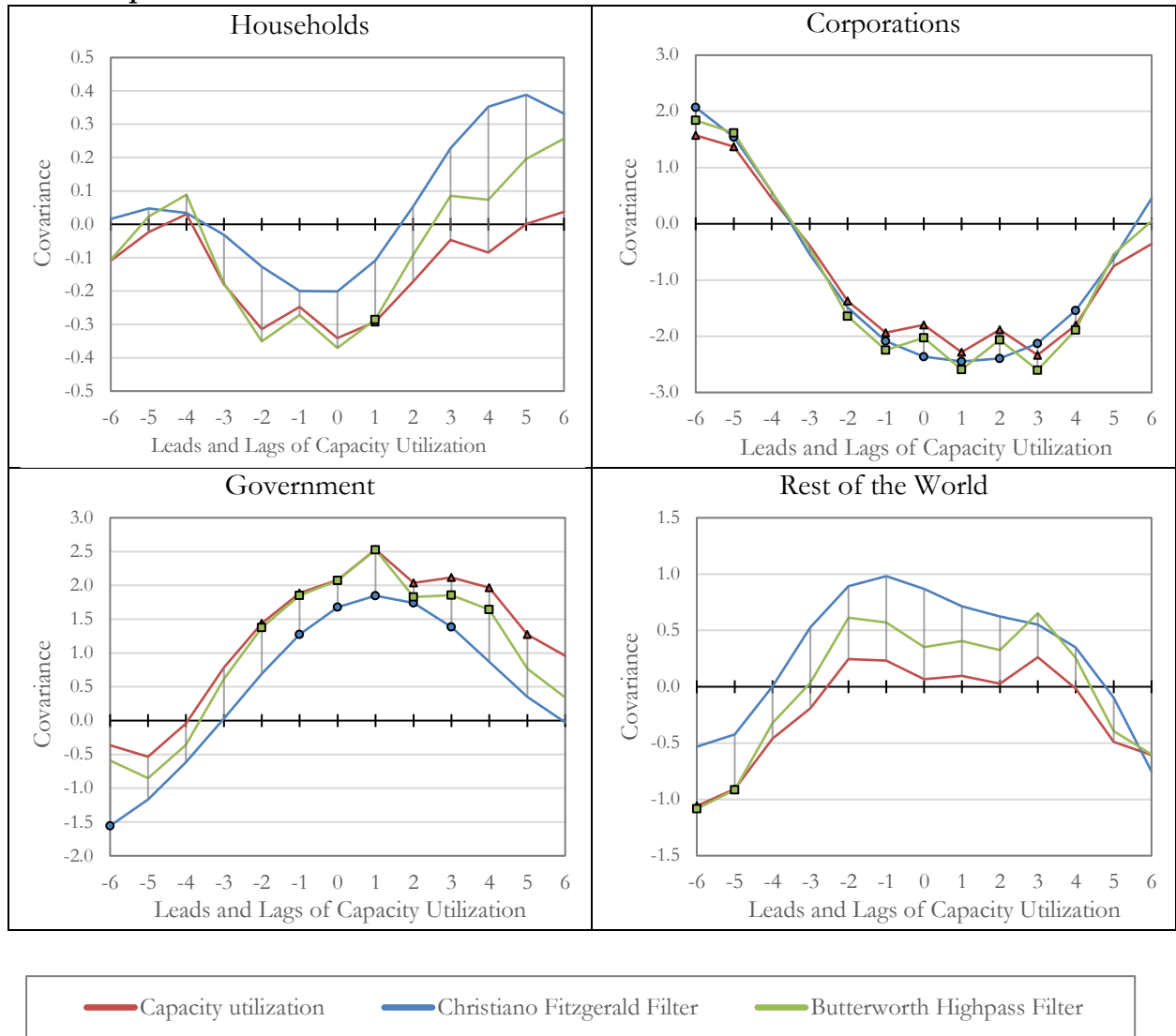
Slovakia



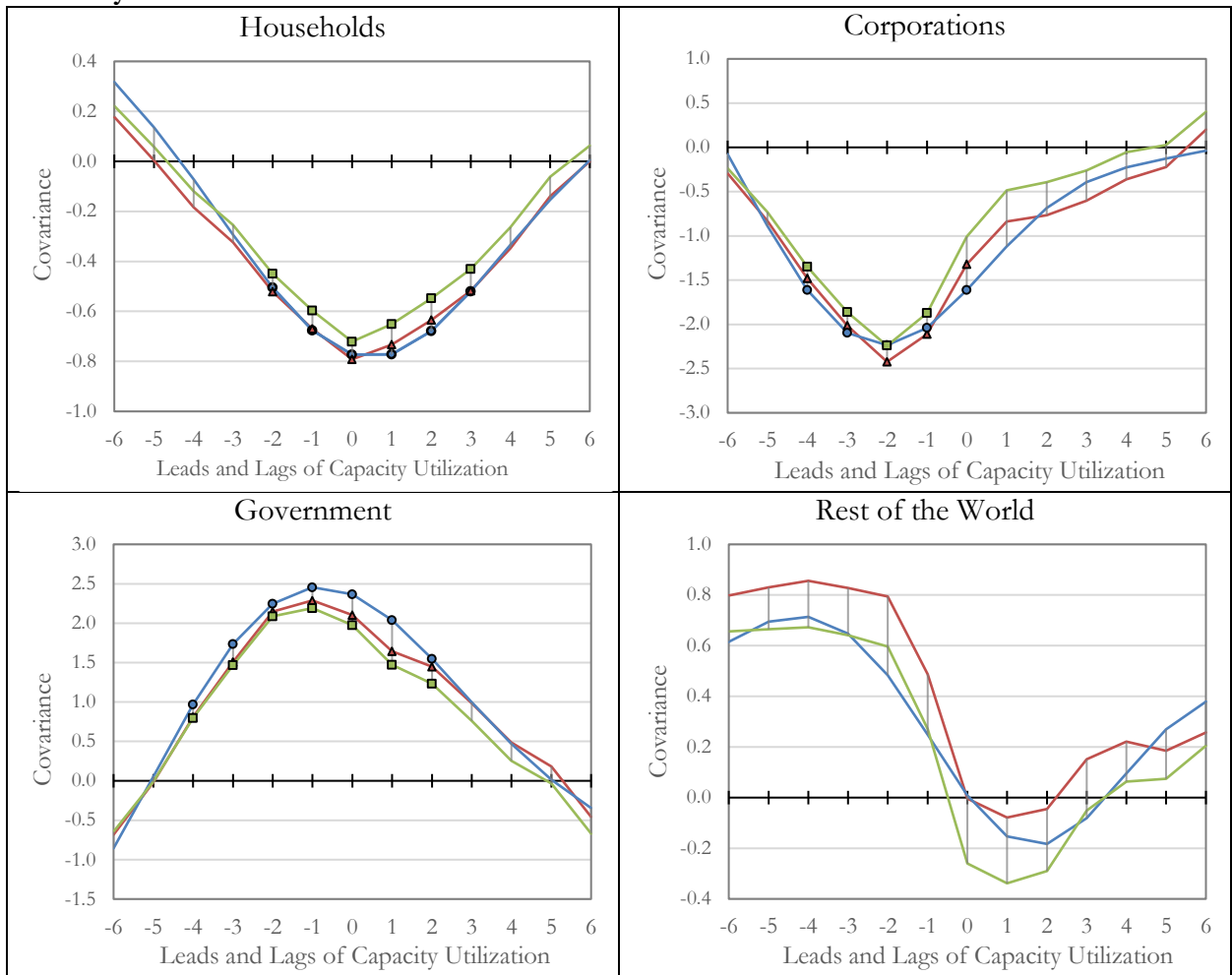
	Government	Corporations	Households	Rest of the world
Government	11.5	-11.1	-1.0	0.6
Corporations	-11.1	37.1	-1.1	-24.9
Households	-1.0	-1.1	1.5	0.7
Rest of the world	0.6	-24.9	0.7	23.6

Appendix D – Robustness Checks

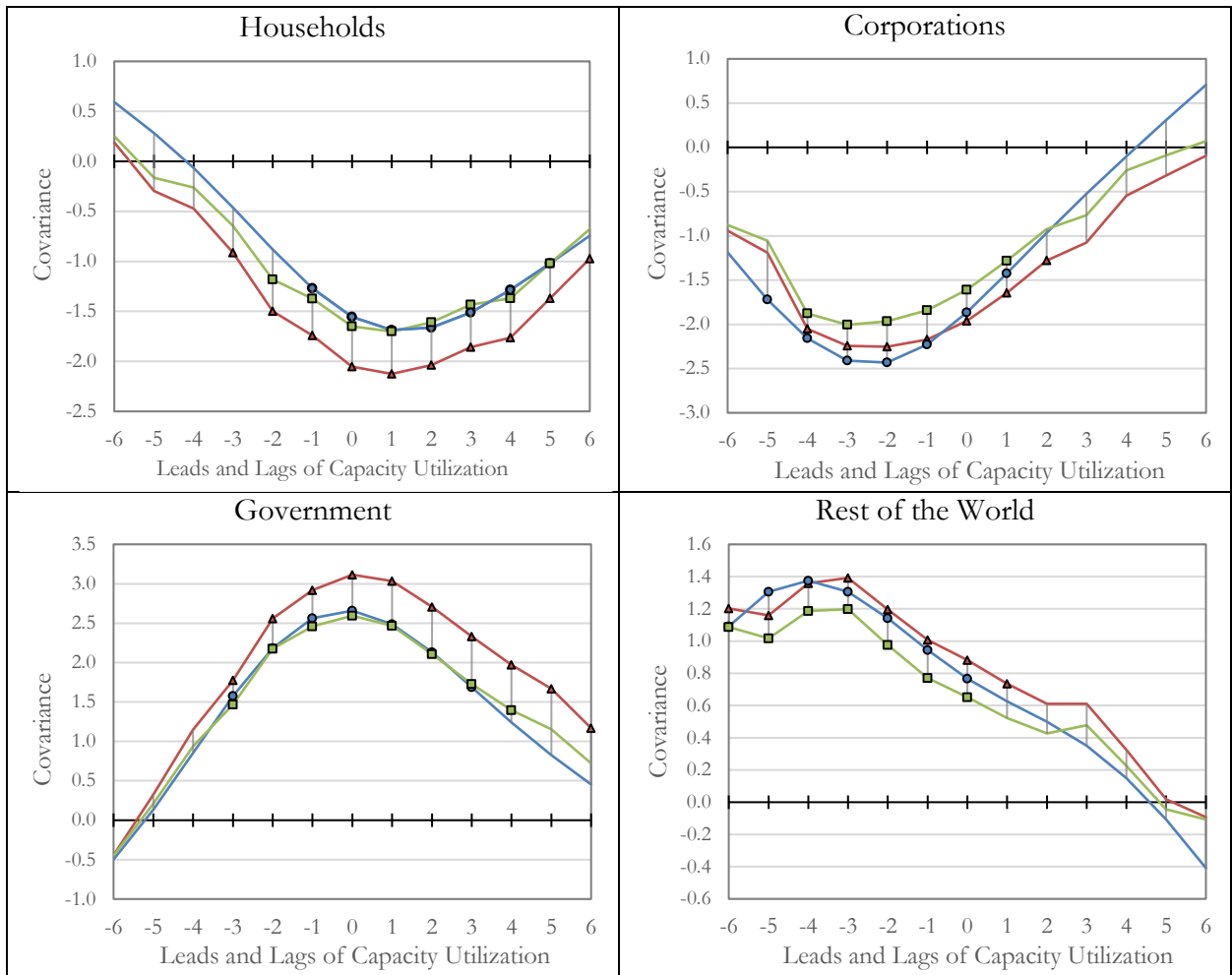
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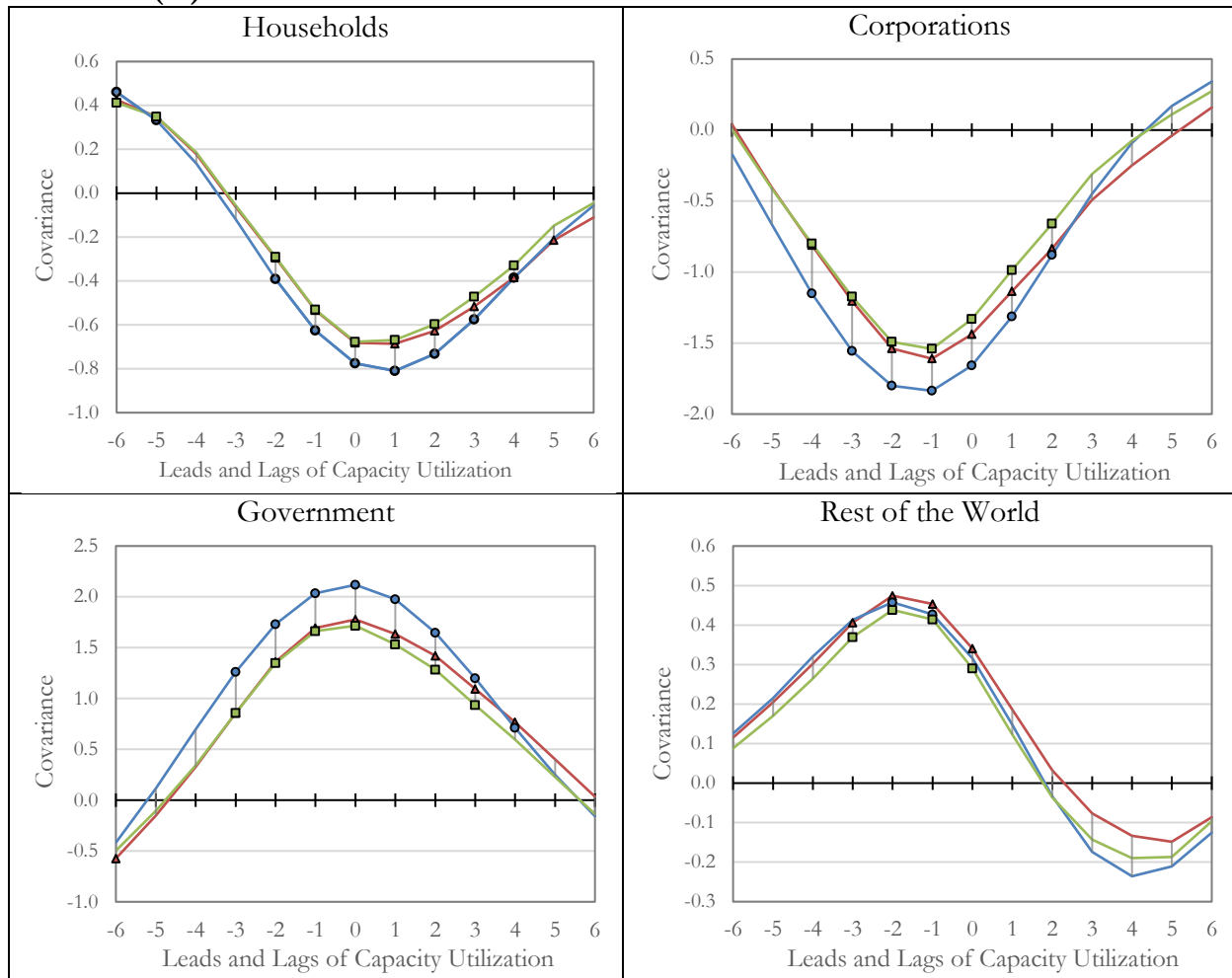
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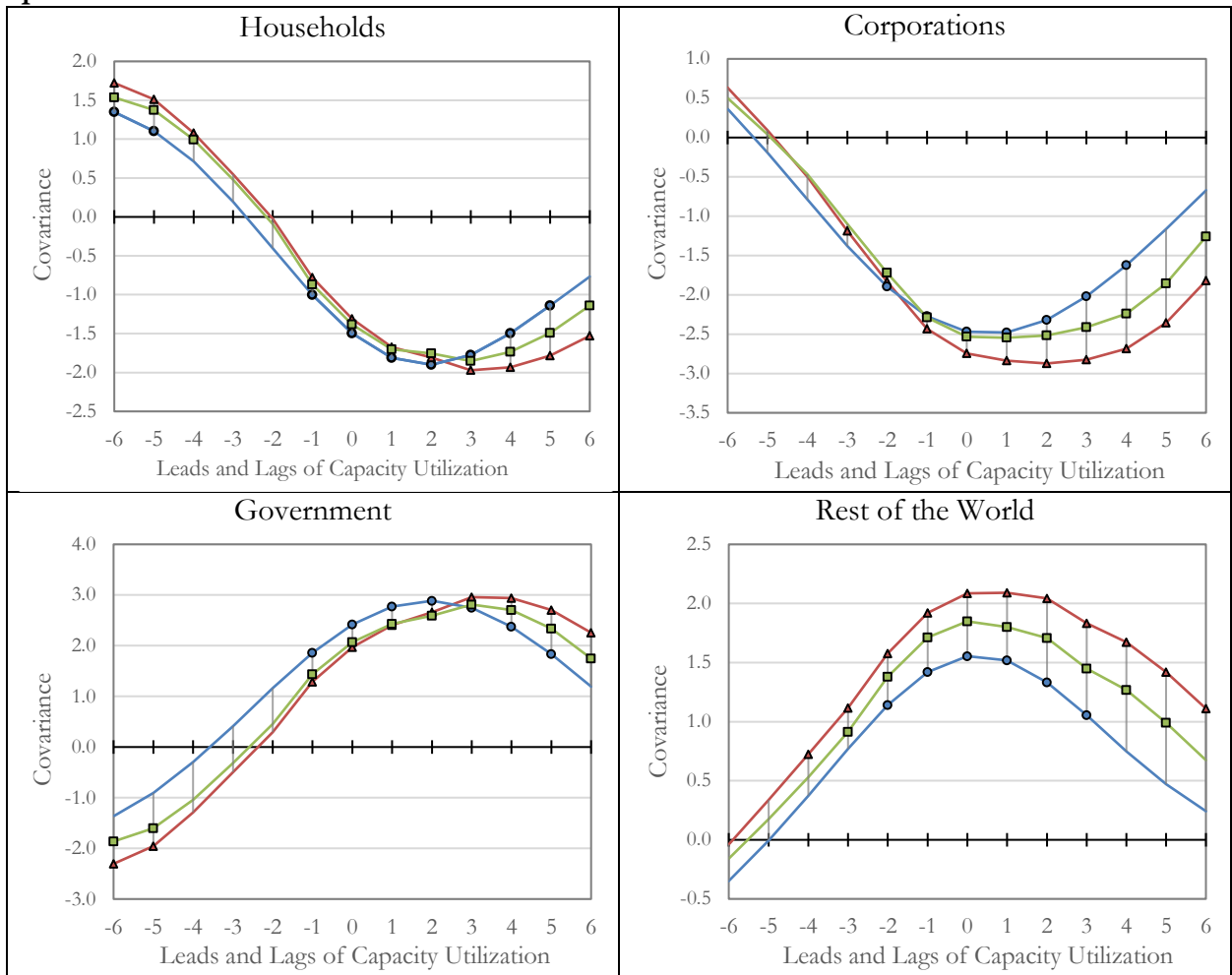
Denmark



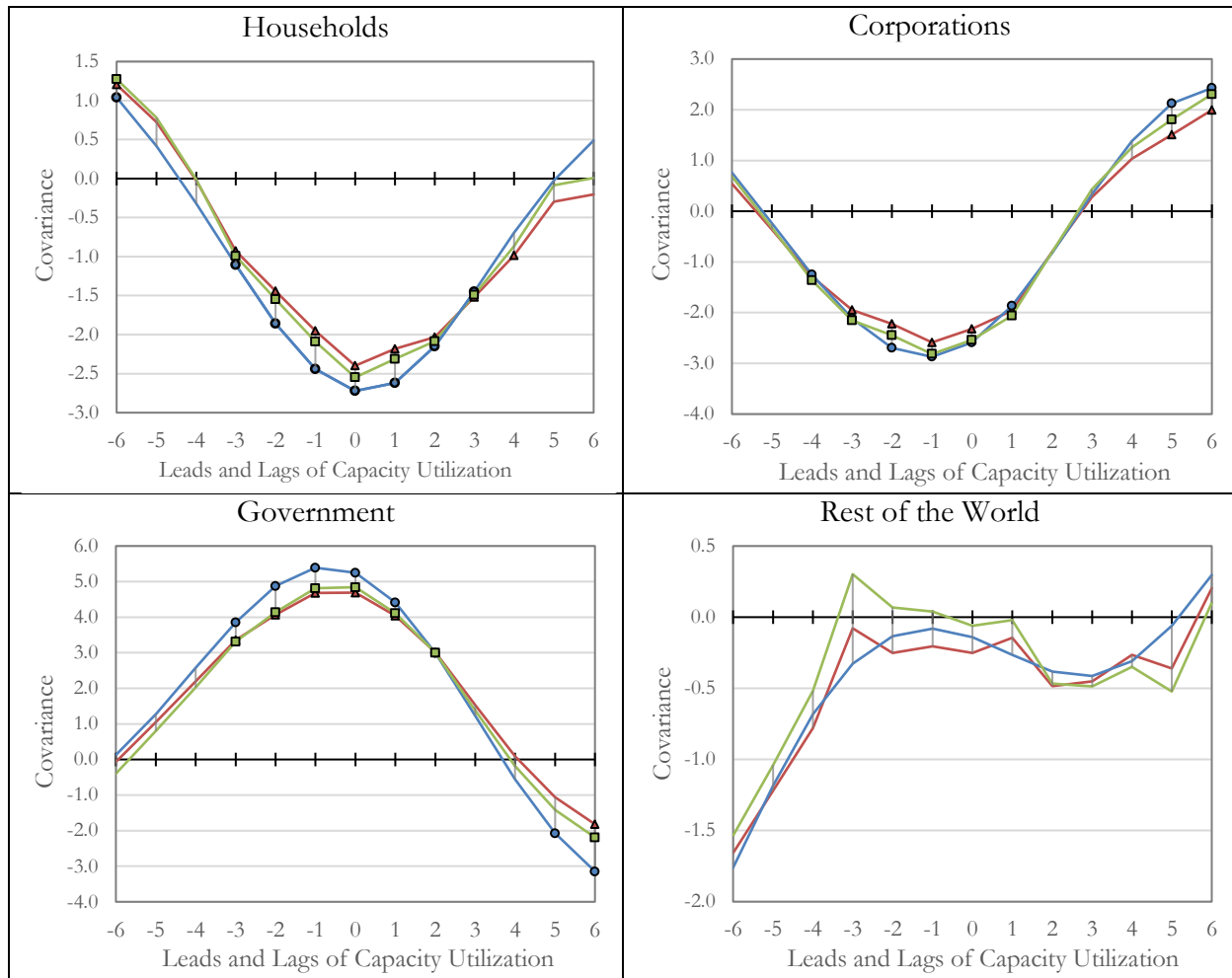
Euro Area (17)



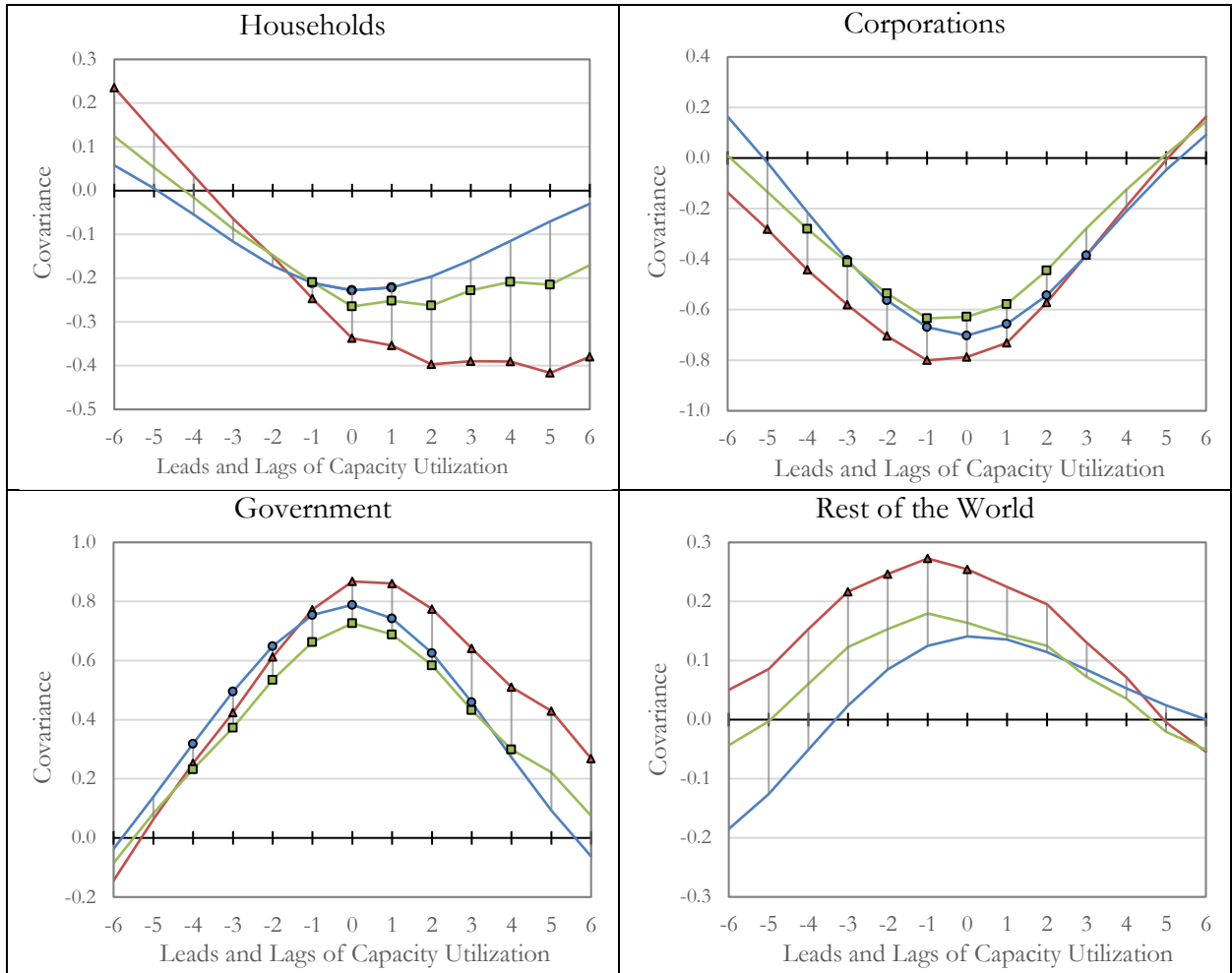
Spain



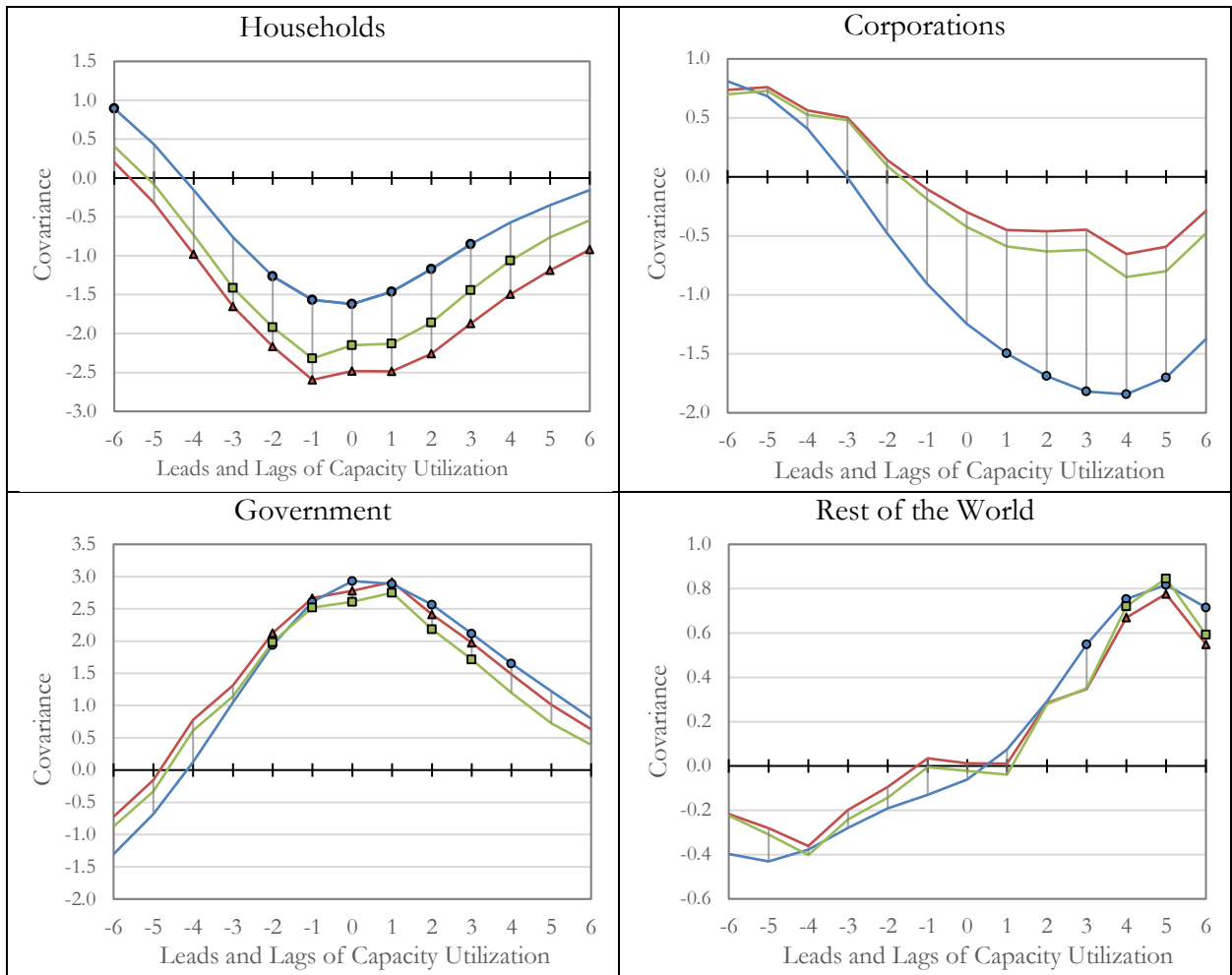
Finland



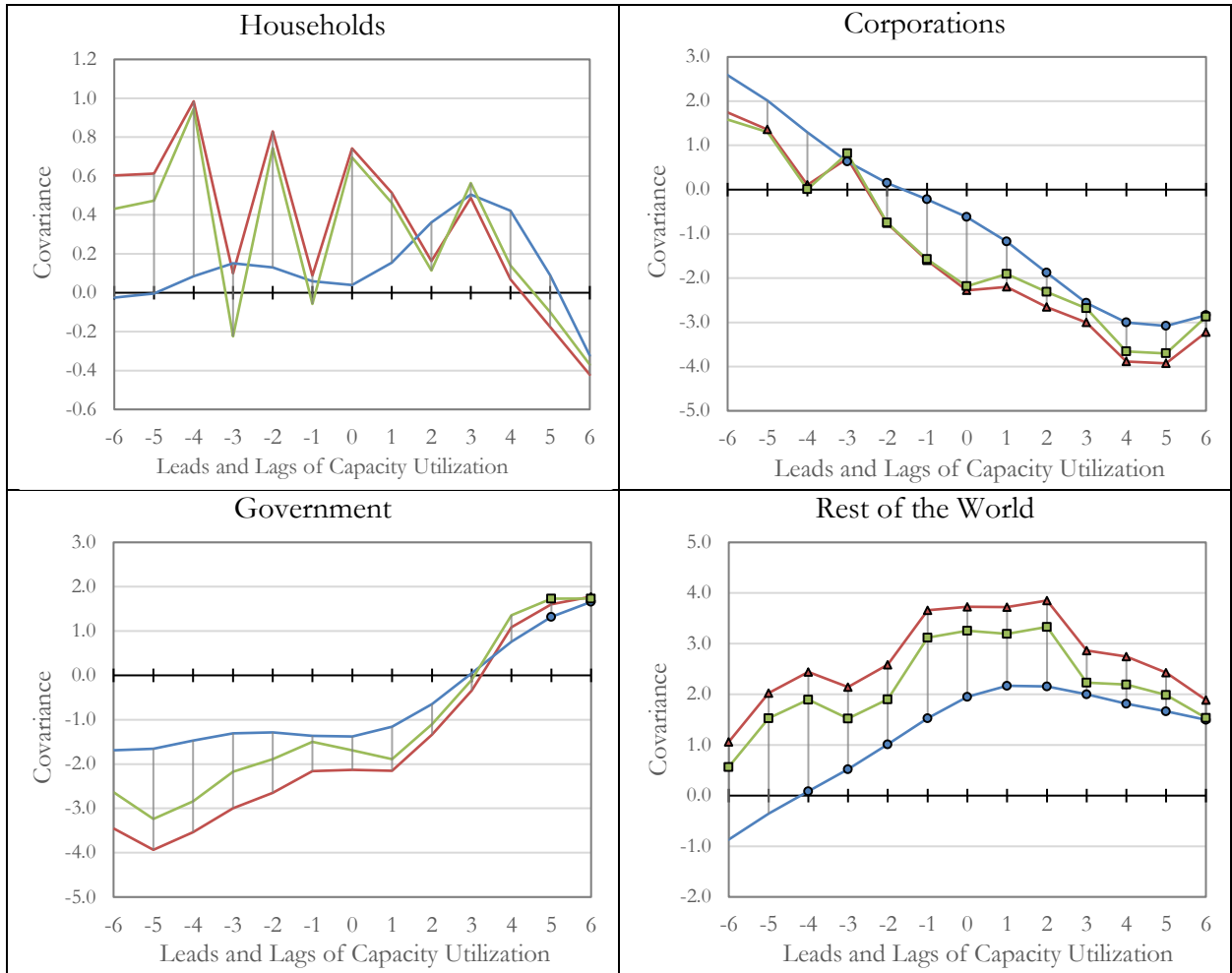
France



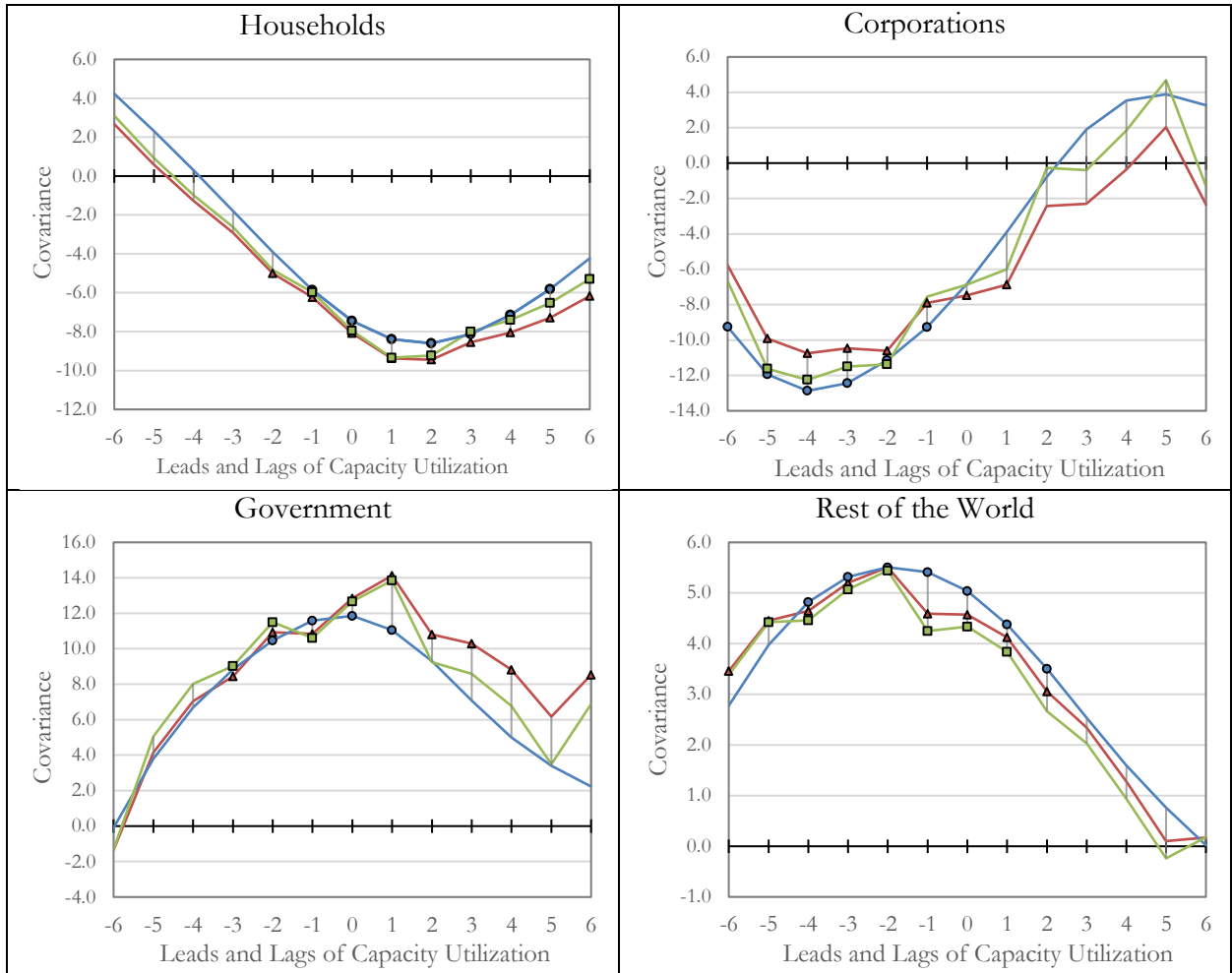
Great Britain



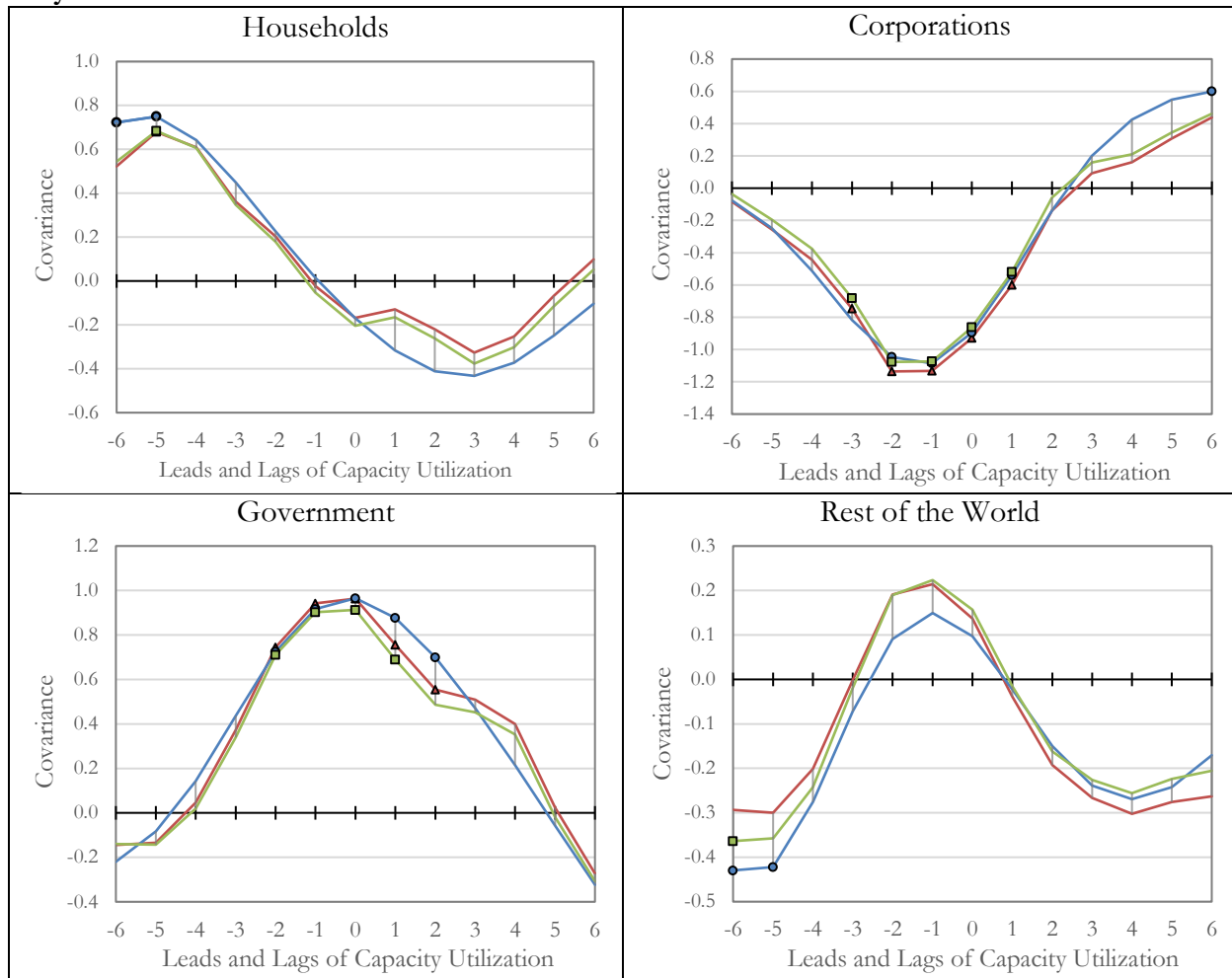
Greece



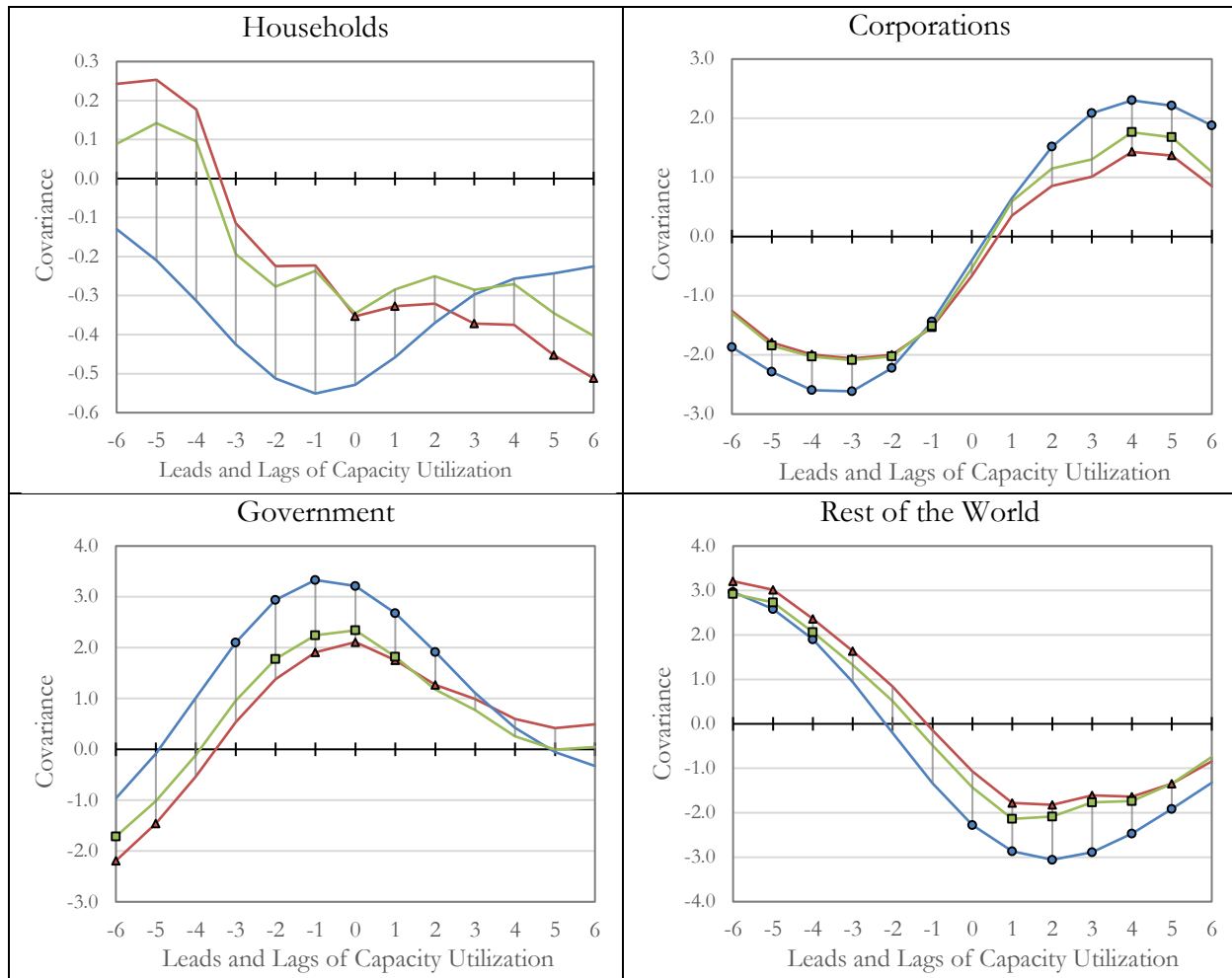
Ireland



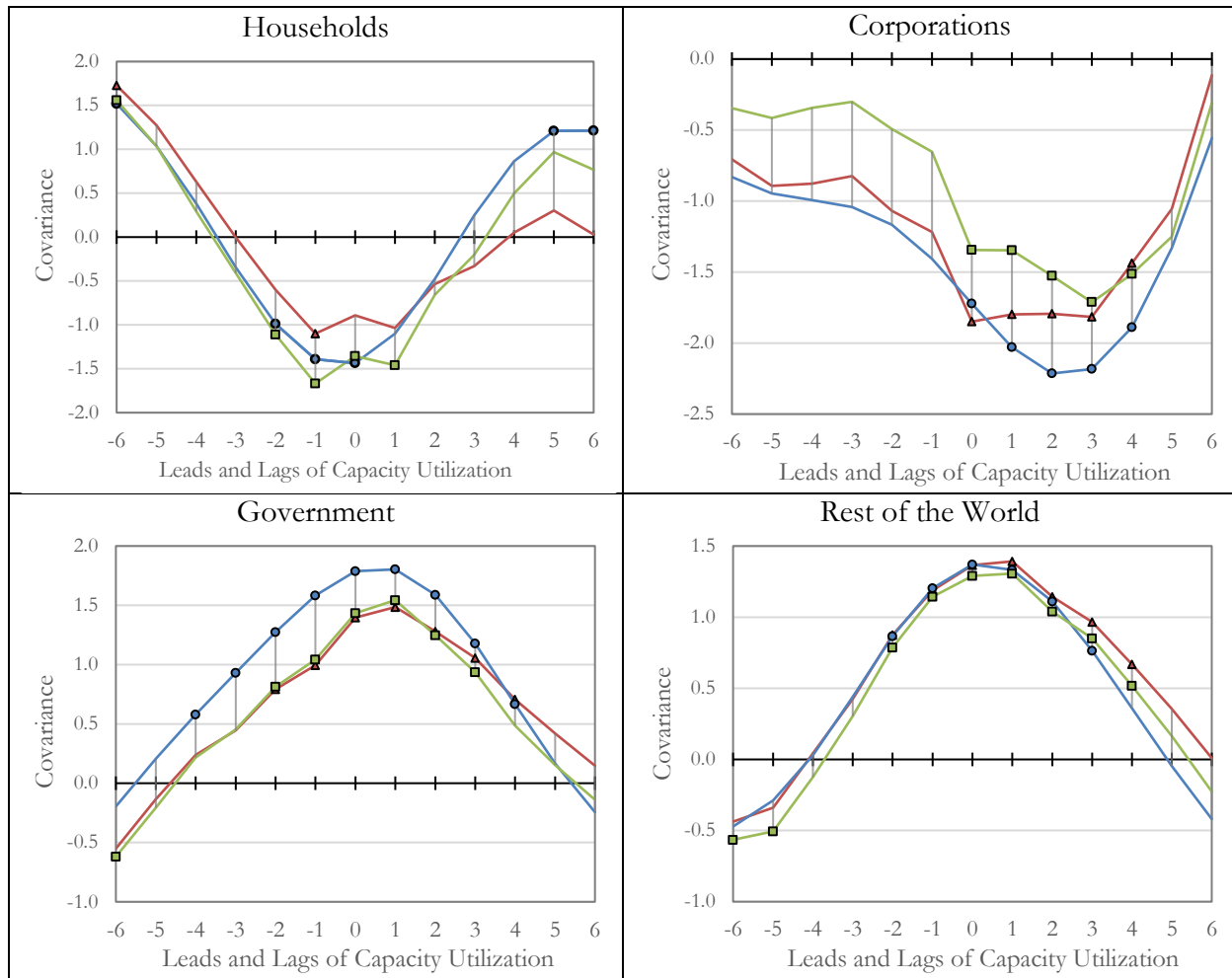
Italy



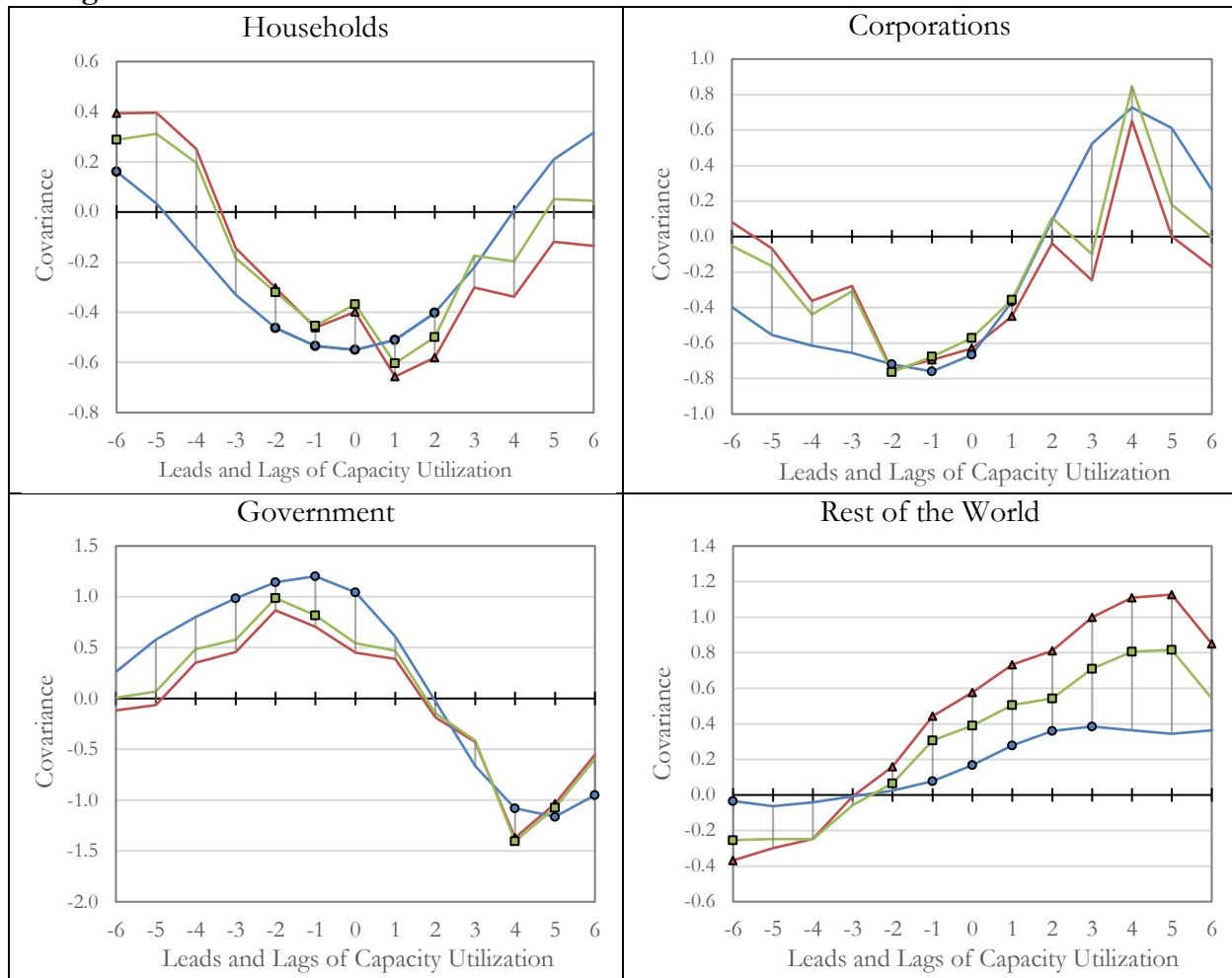
Netherlands



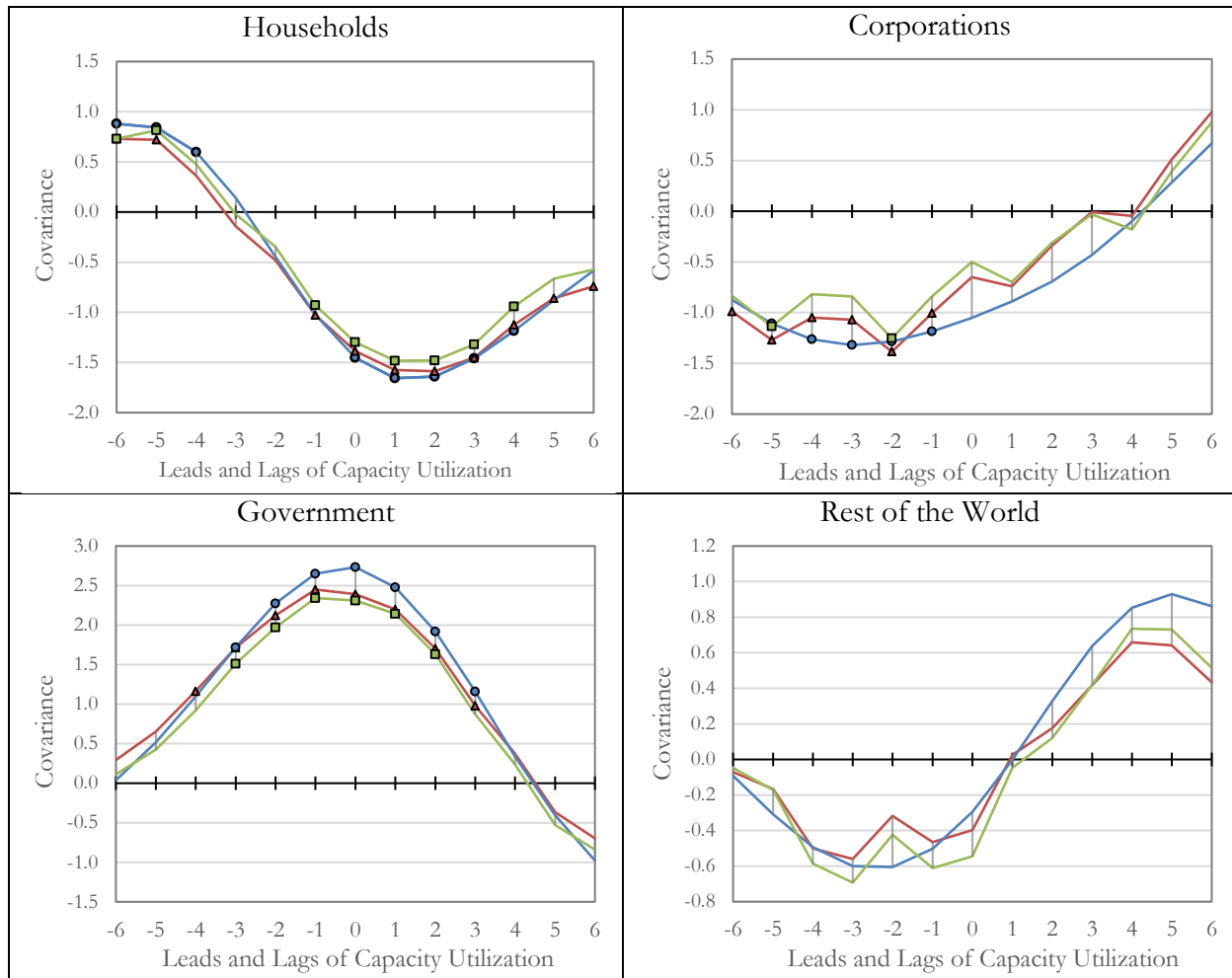
Poland



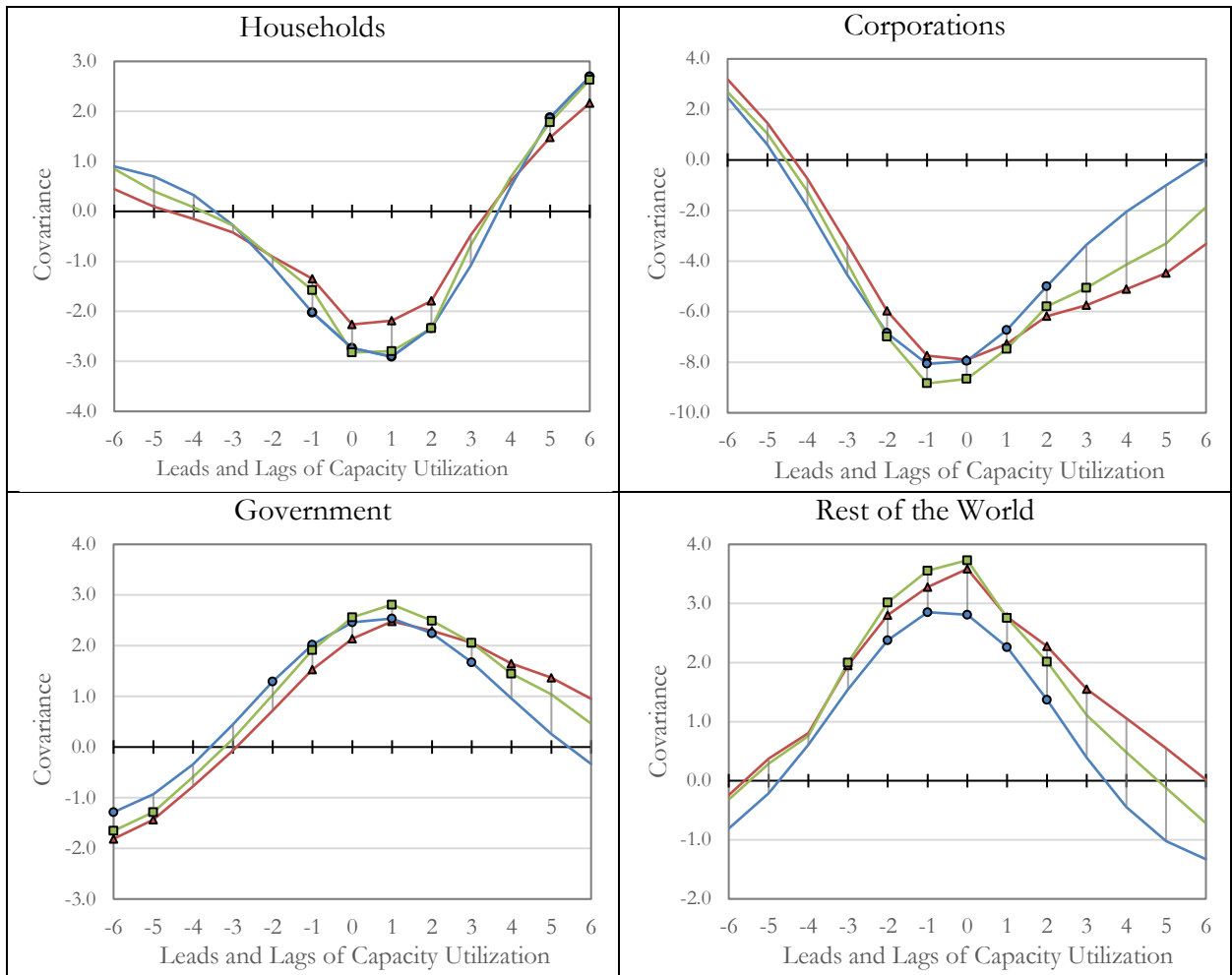
Portugal



Sweden



Slovenia



Appendix E - Data

The core dataset used for the analysis is the Quarterly Euro Area Accounts, provided by the European Central Bank, which consist of a system of interlinked accounts, recording all non-financial and financial transactions, other changes and balance sheets for the institutional sectors of all EU countries – including net lending and net borrowing flows. Net lending and net borrowing is the balancing item of the non-financial accounts and the financial accounts. Therefore, in theory the value should be identical in both accounts. In practice, however, the values may differ significantly due to statistical discrepancies. The non-financial accounts are used as a primary resource, as the net lending data is consistent with data for other variables used in the analysis such as investment or saving. For countries where data was not (fully) available the financial accounts were used as a secondary source. Recalling the statistical discrepancies, it needs to be stated that the absolute height of net lending and net borrowing may not be fully comparable between countries where different sources i.e. financial accounts and non-financial accounts, were used. The data is available for the time period between 1999 (1st quarter) to 2013 (3rd quarter) for most countries, however for some only a fraction of this time period is available. The data was extracted from the Statistical Data Warehouse of the ECB in March 2014, smaller revisions to the data for the year 2013 since then are possible. In the following table, data source and available time period (where data is available for all institutional sectors) are shown for the net lending and net borrowing data of each country. Real GDP Data is used as available from 1980 to 2014q2 from Eurostat to enhance the calculation of the tails of the data series of capacity utilization when the HP-trend is taken.

Country	First available quarter	Last available quarter	Data Source
Austria	2006q1	2013q3	Financial Accounts
Belgium	1999q1	2013q3	Financial Accounts
Czech Republic	1999q1	2013q1	Non-financial Accounts
Germany	1999q1	2013q1	Non-financial Accounts
Denmark	1999q1	2013q1	Non-financial Accounts
Euro Area (17)	1999q1	2013q3	Non-financial Accounts
Estonia	2004q1	2013q3	Financial Accounts
Spain	2000q1	2013q3	Non-financial Accounts
Finland	1999q1	2013q3	Non-financial Accounts
France	1999q1	2013q1	Non-financial Accounts
Great Britain	1999q1	2013q1	Non-financial Accounts
Greece	2000q1	2013q2	Non-financial Accounts
Hungary	1999q1	2013q3	Financial Accounts
Ireland	2002q1	2013q3	Non-financial Accounts
Italy	1999q1	2013q3	Non-financial Accounts
Lithuania	2004q1	2013q3	Financial Accounts
Netherlands	2005q1	2013q3	Non-financial Accounts
Poland	1999q1	2013q2	Non-financial Accounts
Portugal	1999q1	2013q3	Non-financial Accounts
Sweden	1999q1	2013q1	Non-financial Accounts
Slovenia	2005q1	2013q3	Non-financial Accounts
Slovakia	2004q1	2013q3	Financial Accounts

Table 6: Data Sources and time period for Net Lending and Net Borrowing Data

The data is quarterly data for each institutional sector in (almost) all countries in the EU (no [for all sectors complete] data available for Bulgaria, Croatia, Cyprus and Malta). Luxembourg, Latvia and Romania are not analyzed due to the short data series available in addition to the high volatility of the financial accounts data, which is the only available data source. The institutional sectors are defined as the *Non-financial Corporations* (S.11), the *Financial Corporations* (S.12), the *General Government* (S.13), the *Households and Non-profit Institutions serving Households (NPISH)* (S.14 + S.15) and the *Rest of the World* (S.2). The sector *Non-financial Corporations* includes all private and public corporations producing real non-financial goods and services for the market, while the sector *Financial Corporations* comprises all private and public entities engaged in financial intermediation such as such as banks, insurance corporations, investment funds and pension funds. The sector *General Government* incorporates all levels of government as well as the social security system, while public corporations are not included accordingly. The sector *Households and NPISH* furthermore, next to households includes non-incorporated household firms, which cover sole proprietorships and most part ownerships that do not have a legal status and non-profit institutions serving households, such as charities or trade unions. That business activity is to some extent included in the household sector is not ideal for the analysis, especially in countries where this group is comparatively large, e.g. when the agricultural sector is large and dominated by individual or family farms rather than agricultural corporations. However, it is clear that it is conceptually very hard to separate a farm or small business from the owner's household and attempts to do so would yield somewhat arbitrary and artificial results (Steindl 1990, Chapter 14). The sector *Rest of the world* is the mere sum of all sectors of all other countries.

The data was seasonally adjusted using the standard X-12 ARIMA (additive) method developed by the US Census Bureau, which first fits a regARIMA model to the time series and then uses a series of moving averages to decompose a time series into three components (Foldesi et al. 2007; Eurostat 2009; U.S. Census Bureau 2011). A side-effect of the seasonal adjustment is that the new data series minimally deviate from the adding up constraint to sum up to zero in some cases. Moreover, due to the fact that the data series from the financial accounts are strongly fluctuating, alternate in sign, and have irregular components, seasonal adjustment methods such as X-12 ARIMA may yield erratic or not entirely smoothed series (Eurostat & ECB 2007; Eurostat 2009). Therefore, instead of X-12 ARIMA a 4-quarter moving average was used to smooth data from the financial accounts.

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Appendix F - Net Lending and Net Borrowing Algebra and Statistics

Net lending and net borrowing is the balancing item of the non-financial with the financial accounts and can be expressed as the difference between the income (Y_i) and the expenditure (E_i), which is equivalent to the difference between investment (I_i) and saving (S_i), of sector i . A positive value represents a financing surplus, a net lending position, whereas a negative value represents the financing need of the sector which exceeds the income (Y_i) and has thus to be satisfied by a net increase of liabilities i.e. net borrowing (NB_i).

$$\begin{aligned} NL_i &= Y_i - E_i \\ &= S_i - I_i \\ &= -NB_i \end{aligned}$$

Net lending and net borrowing are subject to an adding-up constraint that the financing need of any sector i has to be serviced by the overall financing surplus of all other sectors of the economy. Therefore the sum of all sectors' net lending and net borrowing must equal zero, net Investment has to be financed by net saving:

$$\sum_{\substack{j=1 \\ j \neq i}}^J NL_j + \sum_{\substack{j=1 \\ j \neq i}}^J NB_j = 0 \quad j = 1, \dots, J$$

This is obvious in a closed economy but also holds for an open economy when one sector represents the financial flows to and from the rest of the world. The constraint can be reformulated to read:

$$NL_i = \sum_{\substack{j=1 \\ j \neq i}}^J Y_j - E_i = \sum_{\substack{j=1 \\ j \neq i}}^J S_j - I_i = -NB_i \quad j = 1, \dots, J$$

This adding-up restriction allows for an interesting statistical analysis, as shown by Barbosa-Filho et al. (2008), and summarized in the following.

As holds true in our case, suppose a set of variables x_i sum to zero:

$$\sum_i x_i = 0$$

The covariance of any two variables of the set of variables is denoted as γ_{ij} , the variance of x_i is denoted as γ_{ii} . The standard deviation of x_i , denoted σ_i is equal to the square root of the x_i 's variance. Therefore the correlation coefficient of the variables i and j is given as $\rho_{ij} = \frac{\gamma_{ij}}{\sigma_i \times \sigma_j}$. With the supposition in place that the set of variables x_i sum to zero, we can reformulate the prior equations to yield:

$$\text{Var}\left(\sum_i x_i\right) = 0 = \sum_i \gamma_{ii} + 2 \sum_{i < j} \gamma_{ij}$$

As our adding-up constraint is that the sum of all variables x_i is zero, the variance of the sum will also be equal to zero. The sum of all variances of all variables will be equal to twice the sum of all covariances of all variables.

Furthermore, for any variable z it will be true that the sum of all covariances between all variables x_i and z will be equal to zero:

$$\sum_i \gamma_{iz} = 0$$

, which is equivalent to:

$$\sum_i \rho_{iz} \sigma_i = 0$$

This is of special importance when analyzing the role of net lending of the several sectors (our x_i) in the economic cycle, approximated by capacity utilization (z).

Moreover, in the case that $z = x_i$ it will hold that the variance of a variable x_i is equal to the negative sum of the covariances between x_i and all other x_j . This can be interpreted as the contribution of each covariance to the variance of x_i .

$$\gamma_{ii} = -\sum_{i \neq j} \gamma_{ij}$$



WIRTSCHAFTS
UNIVERSITÄT
WIEN VIENNA
UNIVERSITY OF
ECONOMICS
AND BUSINESS

WU Vienna
Institute for Ecological Economics

Welthandelsplatz 1/D5
A-1020 Vienna

+43 (0)1 313 36 4848
ecolecon@wu.ac.at

INSTITUTE FOR
ECOLOGICAL
ECONOMICS

Vienna University of
Economics and Business