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Effectiveness of capital control, economic growth and animal spirit: A cross-country analysis

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Abstract: This paper is an attempt to understand the mechanism which is thought to be an economic growth interaction between Capital Account Liberalization (CAL) and financial instability. The effect of financial capital liberalization is investigated through a discussion of two main channels of economic performance: animal spirits and economic allocative. In the first step, all determinants of the effectiveness of capital controls are analyzed and they seem to be statistically significant. Then, the analysis investigates the causality effect between economic growth, CAL and financial crisis. Empirical evidence from a sample of 88 countries observed between 1995 and 2005 shows statistical evidence for causality effect. Also, the results suggest that CAL has a positive effect on economic growth since capital follows the rise of economic growth. Control for indirect affects, through instability of the financial sector or animal spirit through banking currency crises, have little effect on the CAL process which points to the political nature of the capital control liberalization.

Key words: Financial Globalisation, Capital Account Liberalization, Financial Crisis, Economic Growth and Aggregate Productivity

JEL classification: G01, G18, OO4

1. Introduction

The liberalization of restrictions on capital control has, on some occasions, been introduced as an economic growth possibility. However, it was also a cause of the financial instability that triggered the banking and currency crises. Academics and practitioners are unable to obtain conclusive evidence on the effect of the CAL process on economic growth¹. Also, there is an intensive discussion regarding the efficiency of capital control and the best techniques to measure the CAL process to understand its impact on economic growth. The changes in legal regulations to increase capital control might be written however, in practice, it does not often happen. As a result, it is worth measuring the CAL process through different approaches. The problem is to choose the right measure which could lead to obtaining an answer on the relationship between economic growth and capital control.

The core aim of this paper is to look at how the main sources of productivity growth and investment capital accumulation react to the CAL process. In this case, this relationship is strictly linked to, at least, two channels. Firstly, to understand if the liberalization of capital controls can improve allocative efficiency and increase the liquidity of the financial market, which would then impact positively on economic growth or vice versa. Gourinchas and Jeanne (2006) show that financial openness stimulates productivity and then impacts positively on the size of welfare gains. This leads to the first hypothesis is: there is a positive relation between economic growth and the CAL process through the allocative efficiency channel. Secondly, an answer to the question above would greatly help in understanding the macroeconomic instability and financial fragility effect of CAL. This second question leads to the second hypothesis: there is a negative relation between financial instability, animal spirits² effect and the CAL process through the decline of economic growth.

In order to answer these questions and test hypotheses, the following methodology is used via a country panel over the period 1980 to 2005. The majority of empirical studies are based on cross country analysis. Three methodologies were implemented to assess the

¹ See Edison, Levine, Ricci and Sløk (2002), Edison, Klein, Ricci and Sløk (2004) and (2002), Kose, Prasad, Rogoff and Wei (2009)

² Animal spirits might be interpreted in both two ways. It might cause a positive impact on the economy via increased positive motivation and stimulated consumption leading to increased economic growth. The negative way is through increased irrational behavior in the market and decrease in economic growth.

effect of economic growth, financial instability and CAL such as descriptive statistics analysis, multinomial probit model and VAR panel. In line with Edwards (2001) and Glick, Gua and Hutchison (2006) specifications, the empirical strategy is centred on exploiting the relation between the effect of capital control reform, economic growth and financial stability via a multinomial probit model analysis. Using de facto indicators of capital control, VAR panel model investigates the possible vice versa relation between economic growth and the CAL process.

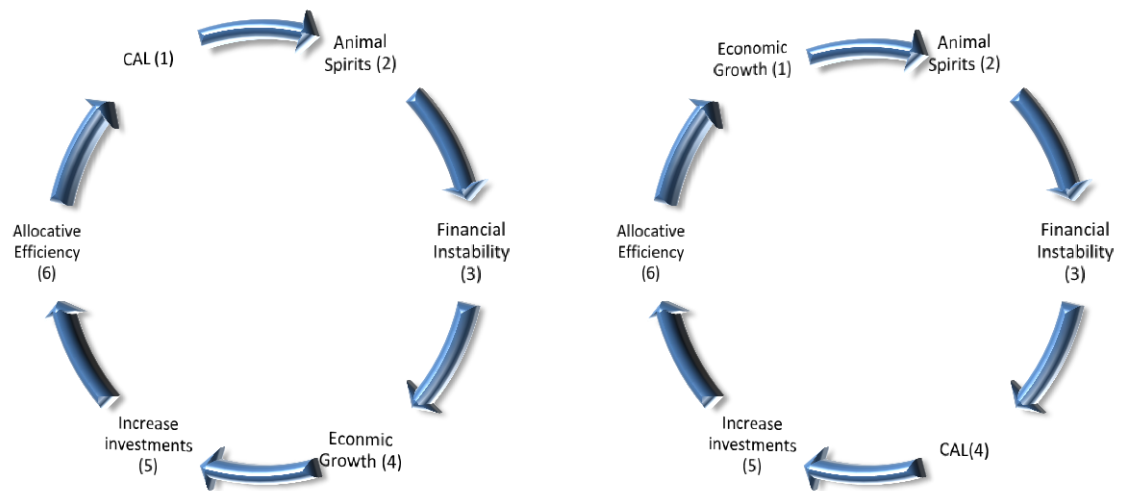
The remainder of the paper has been structured into four sections. Section 2 gives a brief overview of a theoretical framework of economic growth which points to the debate of my empirical methodology. Section 3 describes the empirical strategy and also introduces the dataset and variables used in the empirical model and delineate the estimation strategy. Section 4 presents estimation results that examine the economic growth impact on the probability that capital liberalization occurs, and derives its indirect effect of financial crises on the CAL process. Section 5 concludes and discusses the empirical evidence from the previous section and links this to the results of other empirical studies.

2.Literature review

The literature review has two parts the theoretical background of the empirical analysis and then the relevant empirical literature.

The intensive theoretical debate between the benefits and costs of liberalization of international capital flows has been presented in economic and financial literature. One side of the debate suggests that a removal of these distortions allows capital to be redeployed from low to higher marginal productivity uses (which can be defined as allocative efficiency) leading to higher economic growth (Stiglitz and Charlton, 2004, Dollar and Kray 2001, Sulimierska, 2008b). Moreover, CAL can be considered a factor in the “big push”. It could “push” the creation of a good environment to move an economy from a low level to high level equilibrium, through the incentives of good policies and reforms. On the other hand, removal of capital flows might increase the effect of sudden short-term capital outflows, macroeconomic and financial instability, which can lead to decreased economic growth. This is only one part of the story; because it can exist with the other causal effects and the increase of economic growth and macroeconomic stability can increase the incentive for policymakers to reduce capital control regulation (see Figure 1).

Figure 1. The linkage between CAL and productivity growth.



Notes: (2)- Animal spirits, imperfect market, weak legal framework, (3)- Financial and Macroeconomics instability, (6)- Allocative Efficiency Incentive to good policies, reforms Increase the market liquidity and risk sharing among companies. *Source:* Author's analysis based on Sulimierska (2008a,b), Rodrik (1998), Stiglitz (2002), Chari and Henry (2002), Henry(2000 a,b, 2003, 2007), Chanda (2002,2005), Summers (2000), Glick, Gua and Hutchison (2006), Edwards (2001), Gourinchas and Jeanne (2006).

The empirical review of literature is focused on analyzing the causality relationship between the CAL process, economic growth and financial instability to investigate the causality relation between these three factors (see Figure 1.). The main surveys, with respect to the CAL process, are written by Prasad, Rogoff, Wei and Kose (2003), Klein, Ricci and Slok (2004), and Kose, Prasad, Rogoff and Wei (2009).

A pioneer in the CAL's empirical literature is the Feldstein and Horioka's (1979) paper which employed the saving-investment correlation as the CAL process measurement. They analysed the CAL process' impact through the rate of population growth, trade openness and size of the economy; they did not find conclusive results. However, this method of analysis was highlighted by Obstfeld (1986 a,b) that the facts and data, from national income accounts, do not yield an accurate representation of the CAL process. For instance, correlation measures between saving and investment might increase since, national savings are not precise measures since ownership shares of domestic firms can be held by foreigners. This fact highlights how difficult it is to compare data between different countries and, with focus on aggregate data, the policy-experiment literature does not have enough empirical grounding to be of any use (see Henry 2007). Then, Alesina ,Grill, Milesi

and Ferretti (1993) conducted a study about political determinants of capital control through use of the on/off indicator based on the IMF's AREAER. The empirical results suggested that capital controls are more likely to be imposed by strong governments which have a relatively "free" hand over monetary policy. This analysis did not find that capital controls affected growth therefore the hypothesis that capital controls reduce growth was strongly rejected. On the other hand, Montiel (1994) expands the Feldstein and Horioka (1979) and Obstfeld (1986 a,b) studies by including measures other than the saving–investment correlation such as, gross capital index and test for arbitrage relationship. In this paper, he shows that the increase of financial integration is consistent in all these measures.

At the beginning of the 1990s there were two waves of differing empirical findings. In the first wave, some literature shows that there is a negative effect of CAL on economic growth (see Levine and Zervos, 1998a, Rodrik, 1998, Edison, Klein Ricci, Sløk, 2002, Stigitz, 2000, Chanda, 2002, 2005). The work in this literature employs IMF indicators in cross-time and country analysis. Additionally, these studies used other intensive CAL indicators and consistently found that CAL had a negative effect on economic growth. Then, Kraay (1998) proves that there is little evidence that liberalization of capital flows has a positive impact on economic growth and investment growth by using the capital flow index. Further, Bekaert, Harvey and Lundblad (2009) also find that financial openness impacts more on productivity growth than capital growth and that the effect is more permanent. In the second wave, studies suggest that CAL has a positive impact on economic growth (see Edwards, 1997, 2001, Imbs, 2004, Klein and Giovani, 1999, Bekaert, Campbell and Lundblad, 2005). This line of research analyzes the channel between CAL and productivity growth and, finds a positive impact through capital accumulation (see Arteta, Eichengreen and Wyplosz, 2001, Bonfiglioli, 2008, Bekaert, Harvey and Lundblad, 2009). This line of research went deeper than previous studies, to investigate cross–country, sector and firm level analysis (see Desai, Foley and Hines, 2004, Levchenko, Ranci re, Thoenig, 2009).

Other gains from liberalization might occur through an indirect channel, such as the decrease of capital cost, improvement of financial debts and impact of financial crisis prognosis. Henry (2000b) and Edison and Warnock (2003) found evidence that financial liberalization reduced the cost of capital on stock market exchanges. Also, CAL increased

the development of financial markets, as Chinn and Ito (2005) studied, using measures of the CAL process through indicators based on IMF's AREAER. Lastly, there is a large empirical literature which measures the interaction between capital control and currency–banking crisis. These studies show that capital controls have only a little effect on averting currency-financial crises, at least, not without supporting economic policies (Glick, Guo, Hutchison, 2004 and Sulimierska, 2008b). However, these studies seem to find some evidence of inverse relation between the CAL process, economic growth and financial instability.

The literature review pointed out a lack of a unique answer as to whether the CAL process has a positive impact on economic growth. This suggests that there is a gap in research on CAL measures implemented on a microeconomic level. Further, the analysis of financial liberalization at industry level, instead of country level, might provide greater clarity about the ways in which liberalization affects the real economy (see Henry 2007). The other issues are that the answer is not possible to obtain because the process is going in both directions between economic growth, capital account liberalization and financial instability.

3. Data and empirical strategy

In this section, I discuss the methodology for empirical analysis, data and variables. Variables are presented in three perspectives: control variables, interested independent variables: economic growth and financial instability measures and lastly, explanatory variables: capital control measures.

3.1. Empirical strategy

In order to answer the research question: to define factors of the CAL process, the following methodology was employed in this paper which involves country-level analysis of the linkage between CAL, investment intensity and economic growth. According to the theoretical framework, one potential channel through which CAL may affect efficiency and economic growth, is through the elimination of investment constraints. This might reduce distortions, which then increases investment which could lead to higher productivity growth. The empirical analysis includes two main parts: *descriptive trend analysis of other variables, such as economic growth and financial crisis, and the econometrics model (Probit panel and VAR panel).*

The *econometrics model* is an estimation technique, which is a mixed approach based on studies by Edwards (2001), Glick, Gua and Hutchison (2006) and Sulimierska (2008b). This approach investigates the possibility of a correlation between CAL and the political-economic environment. This model is based on the idea that CAL, as a policy choice, is correlated with macroeconomics, financial and institutional policy and financial crisis. These variables sequentially decrease the probability of increased economic growth. A country, with macroeconomic imbalances, financial weakness, political instability or institutional problems, may choose to retain capital control to avoid the difficulties associated with implementing economic regulations. Therefore, such countries risk triggering a crisis or reducing economic growth (sample selection bias). Especially in the context of financial crisis, which might be important factors which stimulated the capital control policy (Sulimierska, 2008b and Glick, Gua and Hutchison, 2006).

Since there are two main categories of CAL measures: on/off measures (rules-based measures) and intensive measures (quantitative measures), it permits capital control to be analysed from two perspectives. Firstly, the probability of CAL occurs when measured through a probit panel analysis, following Sulimierska (2008b) and Glick, Gua and Hutchison (2006) model. Secondly, intensive measures of the CAL process can be analysed through VAR Panel. Further, it seems rational to use VAR panel because the relationship between CAL, economic growth and financial instability might have also reverse causality characteristics (see Figure 1).

A Probit panel analysis is estimated by three different models, such as a panel linear probability model (PL), a probit panel random effect (PRE) and a probit population-averaged model (PPA). These probit models (PRE and PPA) are cross-country panels (where individual x is country, time is year) with discrete dependent variables $y_{x,t}$. These dependent variables are represented by a binary choice variable $y_{x,t} = 1$ if the event happens or 0 if it does not for individual t at time. In fact, if $P_{x,t}$ is the probability that an individual participated in the event sometime t , this is usually modelled as a function of some explanatory variables $x_{x,t}$:

$$P_{x,t} = \Pr(y_{x,t} = 1) = \Phi(x_{x,t}\beta) \quad (1)$$

Where $\Phi(x_{x,t}\beta) = \int_{-\infty}^{x_{x,t}} \frac{1}{\sqrt{2\pi}} e^{-\frac{u^2}{2}} du$ the cumulative distribution function for standard normal variable and u is the standardized random variable³.

The first model, of so-called *propensity scores*, examines the probability of CAL episodes with respect to three main categories of control variables (x_{xt}): economic variables, structure variables and political variables. In this case, the incident of CAL occurs in country x then $CAL_{xt} = 1$, and otherwise $CAL_{xt} = 0$. Two kinds of selection equation models are computed: *the benchmark Probit model* with three main categories of variables $\Pr(CAL_{xt} = 1) = \Phi(x_{xt}\beta)$ and then the *augmented specification Probit model* with an additional currency crisis or economic dummy variable. The *augmented specification Probit* selection equation was added to the analysis to test the effect of currency crisis episodes/financial crises in the direction of liberalization reforms.

The benchmark and augment specification Probit models have the following forms:

Benchmark probit models:

$$P_{xt} = \Pr(CAL_{xt} = 1) = \Phi(\beta_o + \beta_1'x_{xt}) \quad (2)$$

Augmented specification probit models:

$$\Pr(CAL_{xt} = 1) = \Phi(\beta_o + \beta_1'x_{xt} + \beta_2Crisis_{x,t-1} + \beta_3CAL_{x,t-1}) \quad (3)$$

$$\Pr(CAL_{xt} = 1) = \Phi(\beta_o + \beta_1'x_{xt} + \beta_2Crisis_{xt-1} + \beta_3Growth_{xt-1} + \beta_4CAL_{xt-1}) \quad (4)$$

There are two issues that might arise in these estimations: heterogeneity and cross-section dependence. Cross-section dependence in macro panel data has received a lot of attention in the emerging panel time series literature over the past decade (see Eberhardt, 2011). This type of correlation may arise from globally common shock that have

³See Glick, Gua and Hutchison (2006), Eichengreen (2001) Hendry (2006) and Baltagi (2005). Glick, Gua and Hutchison's (2006) approach is implemented to test the relation between CAL and Currency Crisis, economic growth phenomena with some modification, mainly due to the problem of obtaining data and the fact that there are different areas of regional interests. Glick, Gua and Hutchison's (2006) model is an interesting approach because they tried to connect two different approaches: the leading-indicator methodology and analysis of the correlation between CAL and the political-economic environment. In contrast with Glick, Gua and Hutchison (2006), I investigated the different size and variety of country samples and period. Glick, Gua and Hutchison analysed 69 developing countries over the period 1975-1997.

heterogeneous effects across countries, such as the oil crisis in the 1970s or the global financial crisis from 2007 onwards. Alternatively, it can be the result of local spill-over effects between countries or regions. For a detailed discussion of the topic, within cross-country empirics analysis, see Eberhardt and Teal (2011). For a survey and application of existing cross-section dependence tests refer to Moscone and Tosetti (2009).

A problem of endogeneity of policy changes also arises (see Figure 1). Countries might open-up their economies because they experience sustained economic growth or alternatively they liberalize capital flows to help recover from economic slowdowns caused by financial crises. This negative and positive effect of financial liberalization and a reverse effect between economic growth, financial crisis and CAL, might affect the biased estimation (Bonfiglioli, 2007,2008). All these variables, within the panel VAR, entered as endogenous. In this model, I computed intensive CAL measures. These underlining causalities between CAL, financial crisis and economic growth would be identified. For assisting the exposition, it is considered a first order 3x3 panel-VAR model:

$$Y_{xt} = \mu_x + \Omega Y_{xt-1} + e_{xt} \quad (5)$$

where $x=1, \dots, N$ (country), $t=1, \dots, T$ (year), Y_{xt} is vector of three random variables, that is CAL indicator ($CAL_{x,t}$), economic growth indicator ($Growth_{x,t}$) and crisis indicator ($Crisis_{x,t}$). Thus, Ω is a 3x3 matrix of coefficients, μ_x is a vector of country effects and $e_{x,t}$ are iid residuals.

The panel-VAR is defined in the following form: equations (6), (7) and (8)

$$\begin{aligned} CAL_{xt} &= a_{10} + \sum_{j=1}^J \beta_{11j} CAL_{1,xt-j} + \sum_{j=1}^J \beta_{12j} Growth_{1,xt-j} + \sum_{j=1}^J \beta_{13j} Crisis_{1,xt-j} + \sum_{j=1}^J \beta'_{14j} x_{xt} + e_{1,xt} \\ Growth_{xt} &= a_{10} + \sum_{j=1}^J \beta_{21j} CAL_{1,xt-j} + \sum_{j=1}^J \beta_{22j} Growth_{1,xt-j} + \sum_{j=1}^J \beta_{23j} Crisis_{1,xt-j} + \sum_{j=1}^J \beta'_{24j} x_{xt} + e_{2,x,t} \\ Crisis_{x,t} &= a_{10} + \sum_{j=1}^J \beta_{31j} CAL_{1,xt-j} + \sum_{j=1}^J \beta_{32j} Growth_{1,xt-j} + \sum_{j=1}^J \beta_{33j} Crisis_{1,xt-j} + \sum_{j=1}^J \beta'_{1=34j} x_{xt} + e_{3,x,t} \end{aligned}$$

The moving average (MA) form, of the above model, is based on sets of $CAL_{x,t}$, $Growth_{x,t}$ and $Crisis_{x,t}$ with a proper set of present and pass residuals $e_{1,x,t}$, $e_{2,x,t}$, $e_{3,x,t}$ and $e_{4,x,t}$. Under VAR estimation, the endogeneity assumption states that residuals are

correlated and is the reason for a lack of interpretation of coefficients in the MA process. As Mamatzakis (2013) pointed out, the residuals are orthogonalized by multiplying the MA representation with the Cholesky decomposition of the covariance matrix of residuals. In order to define the optimal lag order j , Lutkepohl's (2006) procedure was employed based on Akaike Information Criteria (AIC) and Arrellano-Bond AR test⁴.

3.2. Data and variables

Explanatory variable – capital control measures

In this paper, there are nine main CAL indicators ($CAL_{x,t}$), that are implemented in the cross-country analysis:

On-off capital transaction index ($imf_{x,t}$): is commonly used in the literature (see Prasad, Rogoff, Wei and Kose, 2003, Edison Klein, Ricci and Sløk, 2004, and Kose, Prasad, Rogoff and Wei, 2009). This indicator is based on whether legal regulations on capital account transactions exist or not according to IMF's AREAER. Data from 1980 to 2006⁵, the indicator is defined as "1" when liberalization of capital control exists or "0" when the country imposes restrictions on capital control.

On/off Chinn and Ito's index: is indicated as more or less restrictive and wider, as in the above description. It is a 1/0 variable which includes more categories than capital transaction restriction from IMF's AREAER, such as the existence of multiple exchange rates, requirement for the surrender of export proceeds, restrictions on current accounts. Also, restriction on capital transactions is defined as less restrictive. In this case, CAL has taken place when more than six categories of Capital Transaction category are realised. The indicator is defined as "1" when liberalization of capital control exists or "0" when the country imposes restrictions on capital control.

SML indicator: is based on legal stock exchange regulations. These regulations can be general measures and there are three main approaches:

- i) *The Policy Approach* is the liberalization of foreign ownership of stock based on government decrees and this is defined as an on/off measure.

⁴ In this work, we implemented VAR(1) and VAR(2), the independent variables were sorted out from the most endogenous to the lowest exogenous.

⁵ Since 1998 there are 12 IMF categories of legal restrictions in Capital Transaction and for this indicator to be equal to 1, all 12 categories need to be realised.

- ii) *The Continuous Variable Approach* is based on three events. Firstly, the date of the first foreign investment in the stock market of the home country. Secondly, the date of the first issue of American Deposit Certificates (ADRs). Thirdly, through changes in the IFC index. The IFC index computes the value of the share of foreign owned companies in the total stock market valuation⁶. If changes in the IFC index crosses a certain benchmark, then the stock market is considered liberalized. This is also an on/off measure.
- iii) *The Mixed Approach* requires a mixture of government legal degree and at least one continuous variable event to signify stock market liberalisation.

The SML measure is obtained from existing papers and includes as large a sample of countries as possible, which are 49 countries⁷. Data is available for the period 1980 to 2011.

Intensity Chinn and Ito indicator (KAOPEN) ranges from -1.7 to +2.6 This index, compiled by Chinn and Ito, is focused on four categories for IMF AREAR such as, the existence of multiple exchange rates, requirement to surrender export proceeds, restrictions on current accounts and on capital transactions, which compute the significant each of them to end up being a continuous variable.

Kray & Swann indicator ($CF_{x,t}$) is a sum of foreign direct investments, foreign portfolio investments and other direct investments as a proportion of GDP. Data is used for the period 1980 to 2005.

Lane and Milesi-Ferretti indicators ($IFIGDP_{x,t}$ $GEQGDP_{x,t}$)

- i) $IFIGDP_{x,t}$ is defined as the sum of foreign direct assets and foreign direct liabilities as a ratio to GDP;
- ii) $GEQGDP_{x,t}$ is defined as a ratio of the sum of foreign direct assets, foreign direct liabilities, foreign portfolio assets and foreign portfolio liabilities to GDP.

Data from 1980 to 2005 is used as continuous variables.

⁶ A foreign owned company is typically defined (by the IMF or OECD) as a company where the foreign ownership share is greater than 10%. If the index increases by more than 10%, then the date this occurs is considered the date of stock market liberalisation.

⁷ Henry (2000a,b), Henry (2003), Kim and Singal (2000), Bekaert and Harvey (2000), Henry and Sasson (2008), Mitton (2006), Bekeart, Campbell and Lundblad (2005) and Chari and Henry (2002)

Chanda's index was compiled based on these two indices from the Economic Freedom of the World known as, i) freedom of citizens to own foreign currency bank accounts domestically and abroad and ii) difference between the Official Exchange Rate and the Black Market Rate. The data period is between 1980 and 2005.

Financial derivatives indicators:

- i) Financial derivatives liabilities indicator (FDL)
- ii) Financial derivatives assets indicator (FDA)

These nine indicators might be divided into groups: on/off measures and continues (intensive) measures. There are several reasons for using on/off measures. Firstly, it is impossible to define the actual moment of liberalization through quantitative measures. This is because of the difficulty in determining what level of increase in interest rate or capital flow is enough to be considered liberalization. Secondly, IMF's AREAER is the main source of capital control data available for the largest number of countries. However, there are some weaknesses in on/off measures. These measures only consider the existence of administrative controls, and moreover, they do not distinguish between restrictions on capital inflows and outflows. As a result, actual capital flow indexes are employed in the analysis as Lane and Milesi-Ferretti indicators ($IFIGDP_{x,t}$ $GEQGDGP_{x,t}$) and the Kray and Swann indicator ($CF_{x,t}$). Moreover, to investigate the intensity of the CAL process, two other measures are used: Chinn and Ito (2005) index and Chanda's index include further the empirical analysis, under the criteria of lowest number of missing values⁸.

Control variables

The other independent variables in the benchmark specification of the probit equation are classified into three categories: structural, political and macroeconomic determinates of the capital account process. The selection of these potential independent variables is guided by previous research in this area such as, Eichengreen (2001), Glick Guo and Hutchison (2006), Bartolini and Drazen (1997), Bai and Wei (2000), Milessi-Ferretti, Razin (1998) and Grilli and Milessi-Ferretti (1995). They found that there is a

⁸ For Chanda's index there are missing values for several countries such as Ghana, Gambia, Jordan, Kyrgyz Rep, Kuwait, Saud Arabia and Swaziland for period 1981-2005 and Lao People Dem Rep. for period 1985-2005 which provides 186 observations for 1980 and 2005. For Chinn and Ito (2002) there are 92 observations.

positive correlation between the increase in the intensity of the capital liberalization process and the relaxation of fiscal policy/trade openness and increase in current account deficits. Moreover, Bai and Wei (2000) and Milessi-Ferretti, Razin (1998) also found that countries with more independent central banks are less likely to use controls. Eichengreen (2001), Glick, Guo and Hutchison (2006) and Grilli and Milessi-Ferretti (1995) suggest that political stability is associated with a lower rate of capital control regulation. On the other hand, a higher international interest rate is connected with a relaxation of capital control regulation, as the countries' authorities are less likely to be worried about the risk of a speculative attack. However, Bartolini and Drazen (1997a,b) found a different correlation and suggested that low world interest rates indicate small capital flows, meaning that there is no incentive to remove the regulation of capital controls. In the case of currency crisis episodes, Edwards (1989) and Glick, Guo and Hutchison (2006) found that capital control is intensified in the year prior to the onset of a currency crisis for instance Russian Crisis in 1998 (Sulimierska 2012).

Macroeconomic factors are calculated as the current account as a percentage of GDP ($CA/GDP_{x,t}$) and level of the real international interest rate ($r_{x,t}^*$)⁹. The economic

⁹ A proxy by the level of the US real long-term interest rate. Following Glick, Guo and Hutchison (2004) and Sulimierska (2008 a,b) studies, $CA/GDP_{x,t}$ international interest rate ($r_{x,t}^*$), this analysis follows Glick, Guo and Hutchison (2004) and Roubini and Sala-i-Martin (1992). The international interest rate was a proxy of the level of USA real long-term interest rate (money market rate) based on macroeconomic data series from IMF's IFS CD-ROOM. As Roubini and Sala-i-Martin (1992) discuss, the real interest rate might be defined as the money market rate or, alternatively, the discount rate for the year, minus the ex post CPI inflation rate over the past year, minus the percentage change. Moreover, the other proxy, of USA real long-term interest rate, was considered such as, Government Bond Yield, corrected for inflation changes. The real interest rate might be defined as the money market rate -IFS line 60- Central bank policy rate or, the discount rate for the year minus the ex post CPI inflation rate over the past year -IFS line 60 b..zf -Federal Funds rate (Units: Percept per Annum) minus the percentage change in line 64..xzf CPI% change (Units: Percept per Annum). The other proxy of US real long interest rate was considered such as Government Bond Yield (IFS line 61zf) though correcting for inflation changes (line 64.xzf CPI% change (Unite: Percept). This interest rate, USA real long-term interest rate (Government Bond Yield), has two types of implementation across various countries or constant with respect to USA. Nevertheless, the last proxy was biased with many missing values for period 1995 to 2005.

⁹ This basic model includes five proxies of the size of government spending ($G_{x,t}$) The data series were taken from United Nations Common Database. To obtain longer periods of government spending, government spending, as a percent of GDP, it was taken from the World Development Indicators (WDI) which was merged with the existing data of Government consumption, national currency and constant as GDP at market prices ($GI_{x,t}$). This was possible because the data were computed in a similar way and it significantly reduced the number of missing observations.

⁹ This variable is computed as the sum of export and import as a percent of GDP and was taken from the IMF IFS CD-room. IFS sum between line D02..9 and D01..9 because trade data had a high number of missing

structure variables are considered as the relative size of government spending, openness to world trade which is measured by the sum of export and import, as a percentage of GDP) and monetary independent variable.¹⁰ A similar situation, in relation to data availability, occurs for Openness to world trade (OP_{xt}).¹¹

The other economic structure variable, the “monetary freedom” index ($MF_{x,t}$), and political variable of political freedom ($PF_{x,t}$) was taken from Economic Freedom index from Heritage Foundation for the period 1995 and 2012. The range of the “monetary freedom” index ($MF_{x,t}$) is between 0-100 percent. The higher the value of index indicates more independent monetary policy in the country. The political explanatory variable ($PF_{x,t}$) is measured in terms of political freedom, as a variable, and is measured on a 0-3 scale where “0” indicates the highest level of freedom.

values⁹, the other dataset from the World Development Indicators (WDI) Data was taken from the IMF IFS CD-room (IFS line DO3...9). However, for this estimation period and country sample, the IMF and SML measures had many missing variables. In order to obtain more actual statistical results, this variable was taken from WDI. In relation to international interest rate ($r_{x,t}^*$), this analysis follows Glick, Guo and Hutchison (2006) and Roubini and Sala-i-Martin (1992). The international interest rate was a proxy of the level of USA real long-term interest rate (money market rate) based on macroeconomic data series from IMF’s IFS CD-ROOM. As Roubini and Sala-i-Martin (1992) discuss, the real interest rate might be defined as the money market rate or, alternatively, the discount rate for the year, minus the ex post CPI inflation rate over the past year, minus the percentage change. Moreover, the other proxy, of USA real long-term interest rate, was considered such as, Government Bond Yield, corrected for inflation changes. The real interest rate might be defined as the money market rate -IFS line 60- Central bank policy rate or, the discount rate for the year minus the ex post CPI inflation rate over the past year -IFS line 60 b..zf -Federal Funds rate (Units: Percent per Annum) minus the percentage change in line 64..xzf CPI% change (Units: Percent per Annum). The other proxy of US real long interest rate was considered such as Government Bond Yield (IFS line 61zf) though correcting for inflation changes (line 64.xzf CPI% change (Unit: Percent)). This interest rate, USA real long-term interest rate (Government Bond Yield), has two types of implementation across various countries or constant with respect to USA. Nevertheless, the last proxy was biased with many missing values for period 1995 to 2005.

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¹¹ This variable is computed as the sum of export and import as a percent of GDP and was taken from the IMF IFS CD-room. IFS sum between line D02..9 and D01..9 because trade data had a high number of missing values¹¹, the other dataset from the World Development Indicators (WDI) Data.

Interested independent variable economic growth and financial instability measures

Economic growth variables

The benchmark for economic growth is defined as a five percent increase in GDP compared to the previous year. For each country (x)-year (t) in this sample for the period 1995 and 2005, a binary measurement of economic growth ($GROW_{x,t}$) is constructed and defined as “1” is an economic growth or, alternatively, “0” is a non-economic growth. If

$$\frac{GDP_{x,t} - GDP_{x,t-1}}{GDP_{x,t-1}} > 5\% \text{ then } GROW_{x,t} = 1 \text{ and vice versa}^{12}.$$

Currency and financial crisis indicators

There are four main currency and financial crisis variables: currency crisis indicators, systematic banking crisis index and systematic crisis indicator. The data was from 1970 to 2011. This variables is defined as a dummy variable “1” if a crisis happens, otherwise is “0”.¹³

A descriptive statistics analysis is now conducted on available data of on/off CAL measures, crises measures and Economic Growth indicator.¹⁴ The estimation period defined for two sub-periods, 1995 to 2005 and 1980 to 2005 representatively, with respect to CAL measures which are available. Four main samples are defined: i) On/off capital transaction index ($imf_{x,t}$) - 90 countries; ii) SML measure ($SML_{x,t}$) - 45 countries; iii) On/off Chinn and Ito's index - 149 countries; iv) lastly, a joint sample for all three on/off measures - 39 countries. However, due to limited availability of other control variables for econometrics analysis, the final estimation sample for on/off capital transaction index ($imf_{x,t}$) estimation

¹² Five percent growth might be interpreted as significant growth, which is between rapid growth and temporary growth. The calculation used GDP at market prices from United Nation Common Database. National currency, constant prices, (WB estimation) [code: 29916].

¹³ Date of crisis extracted from www.luclaeven.com. For Financial Crisis, an modification was implemented by adding financial crisis in Ireland in 2009 and Greece in 2011.

¹⁴ In this paper, the country selection is based on on/off measures availability because of Probit model employment. None of these samples have any missing values, with respect to values for CAL measures, Financial crisis and Economic growth. Although some independent variables described earlier are provided for longer periods, limitations of factors CAL measures and monetary policy measures, and economic growth variable availabilities, caused the reduction in the time period.

includes 88 countries for the period 1995 to 2005¹⁵. Then, there are 44 countries in SML measures sample ($SML_{x,t}$)¹⁶ and 139 countries for on/off Chinn and Ito's index sample¹⁷.

All employed controls and interested variables for Probit and VAR estimation equations are described in. Table 1 and 2 in Appendix provides the descriptions of data sources for CAL measures.

4. Empirical results

An empirical results session has three main parts: descriptive analysis between interested variables, Probit model analysis of CAL factors and VAR econometric model to measure the causality effects between interested variables and capital control indicator.

In order to understand the relationship between financial crisis episodes, the CAL process and economic growth, the descriptive analysis was focused on the period 1995 to 2005. The unconditional and conditional frequencies were computed for different types of crisis and economic growth incidences (see Glick, Guo and Hutchison (2006), p. 8-9). The unconditional frequency does not have any assumptions about the capital account process. The conditional frequency is defined as if the incident, of financial crisis/economic growth, existed during/after liberalization of capital flows.

In this research, the unconditional frequencies were calculated for both the whole group of countries as well as for individual countries. These measures were chosen based on the fact that both of them summarize the information from other measures (of currency crisis, CAL and economic growth). The unconditional frequency, for the whole group of countries, includes observations about the number of "crises" or "liberalization in place" and "incidence of economic growth", divided by the total number of observations. The unconditional frequency was computed by the following equations (9), (10) and (11) which are presented in Tables 1:

$$\Pr(Crisis = 1) = \frac{\text{Number of crises}}{\text{Total country - years}} \quad (9) \quad \text{where Crisis considers the following incidents: Financial Crisis, Systemic Banking Crisis, Currency Crisis index and Debt Crisis.}$$

¹⁵ Data was corrected for Dominica and Zimbabwe.

¹⁶ Data was corrected for Zimbabwe.

¹⁷ For a new version of CAL measure, 10 counties were dropped from the sample including Zimbabwe, Uzbekistan, Myanmar, Comoros, Sri Lanka, Dominica, Eritrea, Grenada, Liberia and Maldives.

$$\Pr(CAL = 1) = \frac{\text{Number of country - years with CAL}}{\text{Total country - years}} \quad (10)$$

$$\Pr(GROW = 1) = \frac{\text{Number of country - years with incident of economic growth}}{\text{Total country - years}} \quad (11)$$

In this case, frequency was calculated for the whole period 1980-2005 (see Table 1.).

Table 1: Financial crises, SML process, CAL process, On/off Chinn and Ito's index and economic growth, unconditional frequency (in percentages)

Categories	SML ($SML_{x,t}$)	CAL ($imf_{x,t}$)	On/off Chinn and Ito's index	SML&CAL	SML&CAL &On/off Chinn and Ito's index
YEAR	1980-2005	1980-2005	1998-2005	1980-2005	1980-2005
Sample size	(45 country)	(90 country)	(149 countries)	(39 country)	(39 country)
Financial crisis	12%	9%	5% *	12%	10% **
Currency crisis	5%	5%	3% *	6%	4% **
Debt crisis	2%	1%	1% *	2%	1% **
Banking crisis	4%	3%	1% *	4%	1% **
SML measures	54%			84%	95%
CAL measures		80%		54%	93% **
On/off Chinn and Ito's index			63% *		57%
Economics growth	41%	35%	41% *	41%	36% **

Source: Author's calculations based on equation (9)-(11) via using IFS data and the IMF's AREAER.

Moreover, crisis frequencies did not fluctuate with respect to different CAL measures and this suggests that there is no strict relation between crisis incidents and the CAL process. Also, it seems that an economic growth also increased during the process of stock market liberalization and capital account liberalization (see Table 1). The previous results are also confirmed through an analysis of on/off Chinn and Ito's index (see Tables 1). On/off Chinn and Ito's index allows a larger sample to be analyzed than with the SML and CAL indexes. A similar conclusion about an insignificant correlation between CAL/SML process and financial crisis can be drawn, and a positive relation between economic growth and liberalization process (Table 1). However, CAL frequency is lower at 60 percent (Table 1). Moreover, the results in Table 1 displayed a stable trend of CAL liberalization and which could suggest that there are factors, which could impact on an

economic growth, other than crisis incidents or liberalization of capital flows (in the legal sense).

A second step was to analyze a conditional frequency of the crisis/economic group. The conditional frequency is measured in two ways. The first conditional frequency of currency crisis/economic growth episodes, measures how many crises/economic growth occurred during the period in which the country liberalized the regulation of capital flows. The conditional frequency was computed according to the followed equations (12) and (13). CAL-currency crisis matrix was based on conditional frequency calculation computed with implementation of all the information from the previous calculation of CAL (CAL measures, On/off Chinn and Ito's index and SML index), crisis episodes and economic growth (Tables 2.).

$$\Pr(CAL = 0 / Crisis = 1) = \frac{\text{Number of indicates the capital control episode in the year of the crisis incident}}{\text{Number of country - years with financial crisis}} \quad (12)$$

where Crisis considers the following incidentals such as Financial Crisis, Systemic Banking Crisis, Currency Crisis index and Debt Crisis.

$$\Pr(CAL = 0 / GROW = 1) = \frac{\text{Number of indicates the capital control episode in the year of the economic growth incident}}{\text{Number of country - years with economic growth}} \quad (13)$$

This CAL-currency crisis matrix analysis is calculated in both directions for dependent probabilities in the case, first the probability that country which liberalizes capital flows was suspected to have had crisis incident/economic growth (or otherwise) (Table 2.) and the second direction analysis, Crisis/Economic growth occurred and liberalization had taken place during previous year.

The CAL-Crisis-Economic Growth matrix shows that crises generally took place during the period of the liberalization of capital flows with around percentages probability (Table 2). These results might be confirmation of an existence of animal spirit. Between 56 and 87 percent of countries that had experienced a financial crisis, introduced CAL and stock market liberalization measures in the same year. However, a country's probability of having a crisis is around 9 percent of total-country-years. On the other hand, these results suggest that generally, economic growth occurs in countries that have liberalized capital

transactions (Table 2). Between 68 and 85 percent of countries that had a financial crisis also introduced a capital account liberalization measure in the same year. Table 2 shows an increase of intensity in different types of financial crisis occurring in the last decade and confirmed the results from the previous CAL-Crisis-Economic Growth matrix (Table 1).

Table 2: CAL indexes, SML index, Crisis indexes and economic growth.

CAL Crisis / Economic growth	CAL ($imf_{x,t}$)	SML ($SML_{x,t}$)	On/off Chinn and Ito's index	SML ($SML_{x,t}$)	SML&CAL	SML&CAL &On/off Chinn and Ito's index
YEAR Sample size	1980-2005 (90 countries)	1980-2005 (45 countries)	1998-2005 (149 countries)	1980-2005 (45 countries)	1980-2005 (39 countries)	1998-2005 (39 countries)
Financial crisis	13% (221)	42% (171)	30% (63)	42% (171)	45% (121)	38% (63)
Currency crisis	9% (106)	28% (72)	9% (35)	28% (72)	32% (56)	34% (35)
Debt crisis	17% (35)	22% (23)	9% (12)	22% (23)	22% (18)	33% (12)
Banking crisis	86% (76)	46% (49)	17% (12)	46% (49)	38.5% (39)	33% (12)
Economic growth	15% (1580)	71% (2174)	32% (483)	71% (2174)	57% (112)	44% (411)

Notes: $\Pr(CAL=0/Crisis=1)$ - indicates the capital control episode in the year of the crisis incident is measured by the number of country-years with CAL and Crisis divided by country-years with financial crisis t and $t-$ years; $\Pr(CAL=0/GROW=1)$ - indicates the capital control episode in the year of the economic growth and is measured by a number of country-years with CAL and Crisis divided by country-years with economic growth t (-) Total number of country –years with respect to different types of crisis/ economic growth. *Source:* Author's calculations based on equation (12)-(13) via using IFS data and the IMF's AREAER.

The analysis of the country sample, which had data available with respect to all three measures (CAL measures, On/off Chinn and Ito's index and SML index), confirmed the existence of animal spirit. It seems that this phenomenon has not been as strong as in the last decade of the analysis period. These results also suggest that generally, economic growth occurs in countries that have liberalized capital transactions.

Now, it is necessary to analyze the second type of conditional frequency of a crisis/economic growth with the possibility that controls are implemented in response to crisis/ economic stagnation (Table 3). In order to simplify the analysis, financial crisis data was used in the calculations. The second type of conditional frequency of financial crisis incidents was calculated according to the formulas below equations 14-17 with

consideration of whether liberalization had occurred (defined as “Yes”) or not (defined as “No”) (Table 3). Moreover, the conditional frequency calculations were performed with consideration of whether liberalization took place at the end of the current year or previous year.

If liberalization happened (defined as “Yes”) at the end of the current or previous year, the conditional frequency is computed as:

$$\Pr(Crisis = 1 / CAL_{t \vee t-1} = 1) = \frac{\text{Number of financial crises for which CAL in place at end of current or previous year}}{\text{Total number of country - years with liberalization in place}} \quad (14)$$

If liberalization happened (defined as “Yes”) at the previous year, the conditional frequency as computed as:

$$\Pr(Crisis = 1 / CAL_{t-1} = 1) = \frac{\text{Number of financial crises for which CAL in place at end of previous year}}{\text{Total number of country - years with liberalization in place}} \quad (15)$$

The conditional frequency of the financial crisis was analyzed as a possibility that capital controls were implemented in response to a crisis incident (defined as “No”) (Table 3).

The conditional frequency was computed in the case if CAL did not take place at the end of the current or previous year by following the equation 14 if $CAL_{t \vee t-1} = 0$. And then, the conditional frequency was calculated CAL did not take place at the previous year by following the equation 15 if $CAL_{t-1} = 0$. In this case, the results show conditional absence of controls at the end of the year prior to a crisis, as well as, at the end of the year in which a crisis occurs (see Table 3).

These results suggest that controls may not be effective and may increase the likelihood of a financial crisis (see Table 3). Between 10 to 17 percent of countries, that introduced a capital account liberalization measure that year or a year later had a financial crisis. Specifically, countries with liberalized capital flows had crises contemporaneously 10 percent of the time, compared to 12 to 18 percent for those with restrictions. This

implies that the presence of capital controls does not reduce a country's exposure to financial instability (see Bartolini and Drazen, 1997 a,b, Glick, Guo and Hutchison, 2006).

Table 3: Financial crisis, frequency condition on the CAL process (in percentages)

Sequence of CAL	Yes*	No**	χ^2_{***}
CAL measure (90 countries period 1980-2005)			
Financial crisis and Liberalization took place during CAL process in the current or previous year	10.5%	18.6%	8.77****
Financial crisis happened and liberalization had taken place during the previous year (formula 7)	10%	1.5%	7.74****
SML index ($SML_{t,x}$) (45 countries, period 1980-2005)			
Financial crisis and Liberalization took place during CAL process in the current or previous year	11%	12.5%	0.0153
Financial crisis happened and liberalization had taken place during the previous year	10.7%	11.8%	0.0001
On/off Chinn and Ito's index (149 countries, period 1980-2005)			
Financial crisis and Liberalization took place during CAL process in the current or previous year	5.9%	2.7%	0.8445
Financial crisis happened and liberalization had taken place during the previous year	3.5%	2%	1.211
CAL measure and SML index (39 countries, period 1980-2005)			
Financial crisis and Liberalization took place during CAL process in the current or previous year (according to CAL measure)	13.5%	8.7%	0.1561
Financial crisis happened and liberalization had taken place during the previous year	12.8	7.7%	0.00
CAL measures, On/off Chinn and Ito's index and SML index (39 countries, period 1998-2005)			
Financial crisis and Liberalization took place during CAL process in the current or previous year	17%	2.4%	8.77****
Financial crisis happened and liberalization had taken place during the previous year	7.3%	1.46%	7.4323****

Notes: Yes-liberalization happened No –liberalization did not take place ***-Chi-Square Test for Independence where a null hypothesis states that an economic growth/ financial crisis are independent from CAL/SML process, **** and ***** indicate rejection of null at 5 percentages and 10 percentages significance levels, respectively. Source: Author's calculations based on IFS data and the IMF's AREAE

Moreover, the Chi-Square Test for Independence confirms these results. However, there are cases which had a different result, for instance, the Russian and Czech Republic crises might suggest that CAL influenced the probability of currency or financial crisis episodes. The Russian case is interesting because two years before 1998 the Russian

authorities liberalized capital flows (see Sulimierska, 2008b, 2012). The Russian authorities restricted capital flows in 1998, the same year as the financial and banking crisis. The Czech Republic liberalized capital flows before 1997 and even after the banking crisis in 1997, the government authorities did not change the direction of the liberalization policy (see Sulimierska, 2008b, 2012).

A similar approach to the conditional frequency of the financial crisis was implemented for economic growth incidents. However, in this case, the relation has a possible opposite direction; the incident of economic growth might have encouraged the government officials to remove the capital control regulations (Table 3). The conditional frequency was computed if liberalization occurred (defined as “Yes”) at the end of the current or previous year, the conditional frequency is computed as equation (16):

$$\Pr(GROW = 1 / CAL = 0_{t \vee t-1}) = \frac{\text{Number of economic growth incidents for which CAL in place at end of current or previous year}}{\text{Total number of country - years with liberalization in place}} \quad (16)$$

If liberalization occurred (defined as “Yes”) at the previous year, the conditional frequency as computed as equation 15:

$$\Pr(ECO_GROW = 1 / CAL_{t-1} = 0) = \frac{\text{Number of economic growth incidents for which CAL in place at end of previous year}}{\text{Total number of country - years with liberalization in place}} \quad (17)$$

On the other hand, it is possible that capital controls took place in response to an economic meltdown (defined as “No”) (Table 4). The conditional frequency was calculated if CAL did not take place at the end of the current or previous year, by following equation 16 if $CAL_{t \vee t-1} = 0$. Then, the conditional frequency was calculated and CAL did not take place the previous year by following the equation 17 if $CAL_{t-1} = 0$. Table 4 presents the results of an absence of controls, at the end of the year prior to economic growth incidents, as well as, at the end of the year in which economic growth occurs.

These results suggest that capital liberalization maybe an effective way to increase economic growth (see Tables 3-4). Around 40 percent of countries, that experienced economic growth, also introduced a CAL measure either in the same year or one year

previously. The countries with capital flow control, experienced economic growth contemporaneously around 20 percent. This implies that the presence of capital controls might reduce a country's ability for economic growth with respect to the three main CAL indicators. The χ^2 statistics for tests of the null hypothesis of independence, between the frequencies of economic growth incidences and whether liberalization took place this year and the year before, rejected the null with respect to the CAL process.

Table 4: Economic growth, frequency condition on CAL process (in percentages)

Sequence of CAL	Yes*	No**	χ^2 ***
CAL measure (90 countries period 1980-2005)			
Economic growth and Liberalization took place during CAL process in the current or previous year (according to CAL measure)	37.7%	7%	12.51****
Economic growth happened and liberalization had taken place during the previous year (according to CAL measure)	35.1%	6.2%	6.71****
SML index (45 countries, period 1980-2005)			
Economic growth and Liberalization took place during CAL process in the current or previous year	38%	41.4%	0.1422
Economic growth happened and liberalization had taken place during the previous year (according to SML index)	33.5%	38.7%	1.8369
On/off Chinn and Ito's index (149 countries, period 1998-2005)			
Economic growth and Liberalization took place during CAL process in the current or previous year	21.3%	21.26%	9.376****
Economic growth happened and liberalization had taken place during the previous year	39.7%	17.8%	12.301****
CAL measures and SML index (39 countries, period 1998-2005)			
Economic growth and Liberalization took place during CAL process in the current or previous year	45.6%	28.9%	0.012
Economic growth happened and liberalization had taken place during the previous year	42.6%	25.7%	0.317*****
CAL measures, On/off Chinn and Ito's index and SML index (39 countries, period 1998-2005)			
Economic growth and Liberalization took place during CAL process in current or the previous year (according to CAL measure)	64%	27.4%	0.132
Economic growth happened and liberalization had taken place during the previous year	36.8%	14.9%	1.1746

Notes: Yes-liberalization happened No –liberalization did not take place ***-Chi-Square Test for Independence where a null hypothesis states that an economic growth/financial crisis are independent from CAL/SML process, **** and ***** indicate rejection of null at 5% and 10% significance levels, respectively. *Source:* Author's calculations based on IFS data and the IMF's AREAE.

To sum up the analysis of this chapter, there might be a positive correlation between CAL and economic growth episodes since 1980; however, there might be a negative correlation between CAL and Financial crisis (Tables 1-4).

4.1. Empirical results of econometrics model on CAL, Financial crises and Economic Growth.

This section has two main parts. The first part discusses the results of Probit panel analysis and defines the factors that might cause the effect. The second part is based on estimating VAR panel to see the inverse effect between CAL, economic growth and financial instability.

4.1.1. Empirical results of econometrics model on CAL, Financial crises and Economic Growth- Probit panel analysis

The model of benchmark equation examines the country likelihood of CAL episodes with respect to three main categories of independent variables ($x_{x,t}$): economic variables, structure variables and political variables. In this case, an incident of CAL happens in country i then $CAL_{x,t} = 1$ and, otherwise $CAL_{x,t} = 0$. The benchmark equation is generally estimated in order to study the sample selection problem. The sample selection bias is connected with the systematic differences between countries that do and do not liberalize the capital account, since only countries with a stable economic-political situation are more likely to liberalize capital control. At the same time, these countries are less likely to have a financial crisis because of good macroeconomic fundamentals.¹⁸ Then, the augmented specification Probit equation was added to the analysis in order to test the effect of currency crisis episodes/financial crises on the direction of liberalization reforms. According to analysis by Edwards (1989) and Glick, Guo and Hutchison (2006), these results confirm that capital controls are frequently increased the year before the onset of financial crisis. In this case, common factors might impact on both a reduction of financial crisis probabilities and an increase of capital account liberalization likelihood to lead governments to reduce capital-account restrictions.

The next part of the results is divided into two sections of Preliminaries: Benchmark estimation equation and Augmented specification analysis. Both panel models were estimated by four different econometrics techniques such as, a panel linear probability model (PL), a Probit panel random effect (PRE), a Probit population-average model (PPA)

¹⁸ Glick, Gou and Hutchison (2006), Eichengreen (2001) and Hendry (2007).

and VAR panel. First is a description of the estimation results for Probit panel analysis and then, the results for VAR panel analysis.

Benchmark estimation equation results

The benchmark Probit equation explains the probability that a country will liberalize capital accounts. The set of control variables in benchmark specification for the selection equation is limited, but these variables are generally available for a wide set of developing countries.

Like the descriptive analysis in section, the analysis was implemented using main samples: between 1995 and 2005 and defined by SML measures (45 countries)¹⁹ and IMF measures (88 countries) and also analysis of a version of the IMF index (139 countries-On/off Chinn and Ito's index) for period between 1998 and 2005.²⁰

All regressions were analyzed and corrected for country specific by adding country effect variables. Moreover, the estimations were corrected for heteroskedasticity (Breusch-Pagan/Cook-Weisberg Test reject hypothesis of homoscedasticity) via Huber-White Robust Standard Errors (robust) and cluster-robust standard errors. If cluster-robust standards are twice as large as default standard errors and cluster –robust t-statistics are half as large as default, then cluster –robust was employed. In addition, in order to avoid endogeneity, the control variables are expressed in a lag form. This variable allows the impact of historical events, which occurred as a result of economic policy, to be measured. In the case of the augment specification Probit equation, the additional explanatory variable was the lagged occurrence of currency crises.

The analysis is done through three main control variables: structural changes, political changes and economic factors.

Structural changes. There is a possible positive correlation between the increase in the intensity of the capital liberalization and the relaxation of fiscal policy and trade openness (see Bai and Wei, 2000 and Milessi-Ferretti and Razin 1998). Governments with high debt may need to finance their debt from foreign sources. This creates an incentive to liberalise capital flows to provide access to non-resident investors so that they can buy

¹⁹ The missing values are for six countries: Czech Rep. (1980-1990), Kuwait (1990-1992), Mauritius (1980), Poland (1980-1990), Russia (1980-1990), Slovakia (1980-1984).

²⁰ The analysis of the joint sample for SML measures and IMF measures (39 countries) for three liberalization indicators (IMF measure, SML measures and On/off Chinn and Ito's index) was also estimated but because of the small size of the sample, the results seem to be convincing in statistical meaning.

government bonds. On the other hand, fiscal expansion through issuances of government bonds might cause inflows of speculative capital into the country. As a result, the government might be willing to stimulate capital flows into the country by increasing capital control regulations. Trade liberalization follows a similar pattern. The increase of trade transactions across borders does not need to increase the incentive to reduce the capital control regulations in the perspective of short-term capital outflows of speculative capital.

Political changes. Bai and Wei (2000) and Milessi-Ferretti and Razin (1998) also found that countries with more independent central banks are less likely to use controls. Eichengreen (2001), Glick, Guo and Hutchison (2006) and Grilli and Milessi-Ferretti (1995) suggest that political stability is associated with a lower rate of capital control regulation.

Economic determinates. It was found that there is a positive correlation between an increase in current account deficits and capital account liberalization (see Bai and Wei, 2000 and Milessi-Ferretti and Razin, 1998). An increase in a current deficit is related to an increase in international integration and this situation might increase the probability of capital control liberalisation. However, if the current account deficit is a permanent characteristic, then this might affect domestic companies that are less productive than their rivals abroad. Therefore, in this case, governments might want to stimulate the current account balance in order to protect the development of the domestic sector.

A similar pattern applies to the international interest rate. A higher international interest rate correlates with a relaxation of capital control regulation as the countries' authorities are less likely to be worried about the risk of a speculative attack. On the other hand, Bartolini and Drazen (1997b) found a different correlation and suggest that low world interest rates indicates small capital flows; meaning that there is no incentive to remove the regulation of capital. In the case of currency crisis episodes, Edwards (1989) and Glick, Guo and Hutchison (2006) found that capital control is intensified in the year prior to the onset of a currency crisis.

Economic and structural variables are expressed as ratio to GDP. In this case, a large current account ratio might be caused, not through an increase in current account deficit, but through a decrease of GDP. In this way, economic stagnation might have a

negative impact on the country's incentives to increase capital account liberalization. Table 11 summaries the above findings:

Table 11: The expected sign of coefficients for benchmark estimations

Variables	Expected sign
$CA / GDP_{x,t-1}$	(+/-)
$G / GDP_{x,t-1}$	(+/-)
$OP_{x,t}$	(+/-)
$MF_{x,t}$	(+)
$PF_{x,t-1}$	(+)
$r^*_{x,t-1}$	(+/-)

All three econometrics techniques were employed: panel linear probability (PL), a probit panel random effect (PRE) and Probit population-averaged (PPA) models for all three different country samples. The estimation used two different types of proxies for international rates: money market USA Central bank policy rate ($r3^*_{x,t-1}$) and the discount rate for the year minus the ex post CPI inflation rate over the past year ($r4^*_{x,t-1}$). In order to analyse for a fixed effect, yearly dummy variables and country dummy variables are introduced for all three types of models (PL, PRE and PRA). However, the effect was not significant and did not cause changes in coefficients for independent variables.²¹ The estimation results from Probit panel models are in accordance with the previous studies carried out in this area. The results seem be consistence across different econometrics techniques and proxies for international interest rates²².

²¹ For each panel linear probability model (PL) international interest rates ($r4^*_{xt}$ $r3^*_{xt}$). Nine models were estimated, including model 1-a simple benchmark model, model 2 simple benchmark model with robust corrections, model 3-a simple benchmark model with cluster robust corrections, a model 4 simple benchmark model with yearly dummies, a model 5 simple benchmark model with country dummies, a model 6 simple benchmark model with yearly dummies and robust correction, a model 7 simple benchmark model with country dummies and robust corrections, a model 8 simple benchmark model with country dummies and cluster robust correction, a model 9 simple benchmark model with yearly dummies and cluster robust correction. For each Probit panel polulation-averaged model (PPA) seven models were estimated such as, model 1-simple benchmark model, model 2 simple benchmark model with robust corrections, a model 3 simple benchmark model with yearly dummies, a model 4 simple benchmark model with country dummies, a model 5 simple benchmark model with yearly dummies and robust correction, a model 6 simple benchmark model with country dummies and robust corrections a model 7 simple benchmark model with country- yearly dummies. For each Probit panel random effect (PRE) four models were estimated model 1 - simple benchmark model, a model 2 simple benchmark model with yearly dummies, a model 3 simple benchmark model with country dummies, and a model 4 simple benchmark model with country-yearly dummies.

²² A similar result was obtained by using the other international interest rate. This model applied USA Central bank policy rate (IFS line 60zf) as the real international interest rate $r3^*_{xt}$.

In the benchmark specification reported, higher world interest rates and institutional quality/political stability are associated with a higher likelihood that capital account liberalization is in place. On the other hand, lower current account deficits, lower trade openness and lower levels of government spending are associated with a higher likelihood of liberalization. However, they are switching the signs of coefficients on government spending and monetary stability. The estimation results from probit panel models are in accordance with the previous studies carried out in this area. Based on a number of observations²³ and critical information criteria (AIC and BIC)²⁴, among all the estimation results for the benchmark equation, two econometrics models were chosen for further estimation: The panel linear probability model (PL) (model 1) and Probit panel random effect (PRE) (model 3). A panel linear probability model (PL) has the lowest value for critical information criteria among all these models with the highest number of observations. On the other hand, probit panel was implemented widely in the literature of Glick, Guo and Hutchison (2006)²⁵. Table 12, 13 and 14 present the results of estimations.

This coefficient suggests that a small increase in current account surpluses reduces the standardized probit index by 0.013-0.0031 of the standard deviation, on average. This impact of current account surpluses is similar to other control variables such as, government spending and trade openness. The explanation for this might be that CAL has become a reform priority in most countries and they liberalized their capital control regulation even if there were outflows of capital (e.g. interest payments). In this case, it suggests that it is a pure political decision rather than economic decision. Further, this result seems to be confirmed by the CAL index which increased by 0.015-0.033 of the standard deviation, on average, through the impact of political liberalization. The monetary stability index shows a mixed impact and there is also a positive impact of international interest rates. These results highlight the effect of international integration (Table 12-14).

²³ The number of observations reduced by implementing a dynamic into the panel by lagged variables (such as monetary freedom and political freedom).

²⁴ The model was selected with a smaller value of AIC and BIC (The Schwarz criterion). Moreover, there were considered differences in AIC and BIC to interpret the strength of evidence for one model than the other model.

²⁵ Probit Population-Averaged model (PRA) was computed for augment equations; however, there are no significant differences in sign and size coefficients.

Table 12: Benchmark estimation results – A sample f IMF index (88 countries)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CA/GDP_{it-1}	-0.013** (0.005)	-0.013** (0.005)	0.000 (0.012)	-0.001 (0.012)	0.004 (0.006)	0.003 (0.006)
G/GDP_{it-1}	-0.030* (0.013)	-0.031* (0.014)	-0.064 (0.037)	-0.067 (0.036)	-0.056* (0.022)	-0.056* (0.022)
OP_t	-0.003** (0.001)	-0.004** (0.001)	-0.008 (0.004)	-0.008* (0.004)	-0.005 (0.003)	-0.005 (0.003)
MF_t	-0.010** (0.003)	-0.012*** (0.003)	-0.018 (0.009)	-0.023** (0.009)	-0.008 (0.004)	-0.012** (0.004)
PF_{t-1}	0.019*** (0.003)	0.020*** (0.003)	0.032*** (0.007)	0.033*** (0.007)	0.015*** (0.004)	0.016*** (0.004)
$r3^*_{t-1}$	0.065* (0.030)		0.147** (0.045)		0.064** (0.023)	
$r4^*_{t-1}$		0.009 (0.034)		0.054 (0.049)		0.014 (0.027)
cons	-0.815** (0.299)	-0.462 (0.270)	-1.147 (0.829)	-0.194 (0.753)	-0.299 (0.460)	0.201 (0.426)
N	791	791	791	791	791	791
AIC	615.0623	619.6731	453.3345	463.4408	.	.
BIC	647.7753	652.3862	490.7209	500.8271	.	.

Notes: It is panel analysis cross time and cross countries. Model 1- panel linear probability model (PL) and $r3^*_{t-1}$ Model 2- panel linear probability model (PL) and $r4^*_{t-1}$ Model 3- Probit panel random effect (PRE) and $r3^*_{t-1}$ Model 4- Probit panel random effect (PRE) and $r4^*_{t-1}$ Model 5 - Probit Population-Averaged model (PRA) and $r3^*_{t-1}$ Model 6- Probit Population-Averaged model (PRA) and $r4^*_{t-1}$ Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001.

Source: Author's estimation based on data source described in previous section.

Table 13: Benchmark estimation results – A sample of SML index (44 countries)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CA/GDP_{it-1}	-0.031** (0.011)	-0.031* (0.013)	-0.074 (0.042)	-0.062 (0.038)	-0.037 (0.021)	-0.036 (0.022)
G/GDP_{it-1}	0.043* (0.02)	0.044* (0.02)	-0.004 (0.084)	0.011 (0.084)	0.033 (0.023)	0.038 (0.022)
OP_t	-0.022*** (0.004)	-0.022*** (0.004)	-0.036** (0.011)	-0.036** (0.011)	-0.021*** (0.004)	-0.022*** (0.004)
MF_t	0.027* (0.012)	0.028* (0.011)	0.053* (0.024)	0.055* (0.023)	0.028* (0.011)	0.030** (0.01)
PF_{t-1}	-0.012 (0.009)	-0.012 (0.009)	0.005 (0.026)	0.001 (0.024)	-0.006 (0.012)	-0.008 (0.012)
$r3^*_{t-1}$	-0.001 (0.07)		-0.104 (0.125)		-0.028 (0.069)	
$r4^*_{t-1}$		0.051 (0.079)		0.067 (0.126)		0.042 (0.041)
cons	1.887** (0.684)	1.753** (0.561)	3.474 (2.163)	2.502 (1.892)	1.720** (0.634)	1.425** (0.462)
N	420	420	420	420	420	420
AIC	104.91	104.56	87.62	88.12	.	.
BIC	133.2	132.84	119.95	120.44	.	.

Table 14: Benchmark estimation results – A sample of version of IMF index (139 countries)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CA/GDP_{it-1}	-0.014 (0.014)	-0.014 (0.014)	-0.036 (0.027)	-0.027 (0.031)	-0.003 (0.004)	-0.003 (0.004)
G/GDP_{it-1}	0.014 (0.018)	0.014 (0.018)	0.097* (0.043)	0.099 (0.07)	0.016 (0.009)	0.016 (0.009)
OP_t	0.001 (0.002)	0.001 (0.002)	-0.002 (0.004)	-0.002 (0.007)	-0.001 (0.001)	-0.001 (0.001)
MF_t	0.013* (0.006)	0.013* (0.006)	0.029 (0.016)	0.033 (0.017)	0.004* (0.002)	0.004* (0.002)
PF_{t-1}	0.031*** (0.006)	0.031*** (0.006)	0.080*** (0.013)	0.109*** (0.015)	0.012*** (0.003)	0.012*** (0.003)
$r3^*_{t-1}$	0.007 (0.016)		-0.003 (0.062)		-0.001 (0.008)	-0.001 (0.008)
$r4^*_{t-1}$		0.011 (0.019)		0.02 (0.067)		
cons	-2.807*** (0.564)	-2.807*** (0.556)	-9.706*** (1.488)	-10.510*** (1.785)	-1.301*** (0.274)	-1.301*** (0.274)
N	890	890	890	890	890	890
AIC	892.276	892.178	379.548	381.8	.	.
BIC	925.814	925.716	417.878	420.13	.	.

Notes: It is panel analysis cross time and cross countries. Model 1- panel linear probability model (PL) and $r3^*_{t-1}$ Model 2- panel linear probability model (PL) and $r4^*_{t-1}$ Model 3- Probit panel random effect (PRE) and $r3^*_{t-1}$ Model 4- Probit panel random effect (PRE) and $r4^*_{t-1}$ Model 5 - Probit Population-Averaged model (PRA) and $r3^*_{t-1}$ Model 6- Probit Population-Averaged model (PRA) and $r4^*_{t-1}$ Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001.

Source: Author's estimation based on data source described in previous section.

Augmented Probit selection equations results

In addition to benchmark estimation variables (Table 15), the augmented Probit selection equations were estimated by including five additional variables: currency crisis incidents- $CU_{x,t-1}$, debt crisis incidents- $DC_{x,t-1}$, banking crisis incidents- $BC_{x,t-1}$, financial crisis incidents- $FC_{x,t-1}$ and economic growth incidents- $GROW_{x,t-1}$. All crisis indicators analyse the impact of negative implications caused by financial instability and reduction of incentives to reduce capital control. In the same way that economic growth variables work, an increase in economic stagnation might have a negative impact on the country's incentive to increase capital account liberalization.

Table 15: The expected sign of coefficients for augmented Probit selection equations

Variables	Expected sign
$imf_{x,t-1}$ /On/off Chinn and Ito's index/ $SML_{x,t-1}$	(+)
$FC_{x,t-1}$	(-)
$CU_{x,t-1}$	(-)
$DC_{x,t-1}$	(-)
$BC_{x,t-1}$	(-)
$GROW_{x,t-1}$	(+)

The augmented probit selection equations estimations are done with respect to three different country samples and using two main econometric techniques: Panel linear probability model (PL) and Probit panel random effect (PRE). Both these models provide consistent results and they are often implemented in the literature. Furthermore, the result from the augmented specification probit model implies that the occurrence of a capital account liberalization in the previous year, increased the standardized probit index by 2, 5-10 of standard deviation, on average across different measures of the CAL process. The stronger effect is visible through Stock Market Liberalization which is two times bigger than other the CAL affects through version of IMF measures. These results seem to confirm previous findings that policy perception and sequences have more impact on the CAL process than economics fundamentals (Table 16-18).

The estimation results for a sample of different IMF indicators do not show any significant negative effect on the probability of CAL happening. Only the econometric analysis of SML measures sample implies that the occurrence of a currency crisis in the previous year reduced the standardized probit index of SML process by -5.373 of standard deviation, on average. Also, there is a positive impact on the economic growth on the probability of CAL happening.- the occurrence of economic growth of more than 5 percentage in the previous year reduced the standardized probit index of SML process by 1.680 of standard deviation, on average. This might suggest that the Stock market is more sensitive to macroeconomics changes than other parts of the market. Therefore, regulation is implemented slower there rather than at the Stock exchange market (see Table 16-18).

Table 16: Augment estimation results – A sample of version of IMF index (139 countries)

	PL		PRE	
	Model 1	Model 2	Model 1	Model 2
$CA / GDP_{x,t-1}$	-0.014	-0.008	-0.036	-0.008
	(0.014)	(0.011)	(0.027)	(0.013)
$G / GDP_{x,t-1}$	0.014	0.000	0.097*	0.001
	(0.018)	(0.014)	(0.043)	(0.017)
$OP_{x,t}$	0.001	0.001	-0.002	0.000
	(0.002)	(0.002)	(0.004)	(0.002)
$MF_{x,t}$	0.013*	-0.003	0.029	-0.003
	(0.006)	(0.005)	(0.016)	(0.007)
$PF_{x,t-1}$	0.031***	0.006	0.080***	0.007
	(0.006)	(0.006)	(0.013)	(0.005)
$r3^*_{x,t-1}$	0.007	0.054	-0.003	0.057
	(0.016)	(0.042)	(0.062)	(0.048)
$FC_{x,t-1}$		-0.171		-0.173
		(0.173)		(0.428)
$On/off\ Chinn\ and\ Ito's\ index_{x,t-1}$		3.806***		3.906***
		(0.201)		(0.309)
Cons	-2.807***	-2.274***	-9.706***	-2.406***
	(0.564)	(0.494)	(1.488)	(0.628)
N	890	890	890	890
AIC	892.276	226.491	379.548	228.223
BIC	925.814	269.612	417.878	276.135

Source: Author's estimation based on data source described in previous section.

Notes: Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001.

Table 17: Augment estimation results – A sample of SML index (44 countries)

	PL model			PRE model	
	Model 1	Model 2	Model 3	Model 1	Model 2
$CA / GDP_{it,t-1}$	-0.031**	-0.065	-0.174	-0.074	-0.110
	(0.011)	(0.119)	(0.093)	(0.042)	(0.112)
$G / GDP_{x,y-1}$	0.043*	0.230*	0.305***	-0.004	0.230
	(0.020)	(0.094)	(0.078)	(0.084)	(0.139)
$OP_{x,t}$	-0.022***	-0.032***	-0.047**	-0.036**	-0.035*
	(0.004)	(0.010)	(0.017)	(0.011)	(0.015)
$MF_{x,t}$	0.027*	0.027	0.015	0.053*	0.024
	(0.012)	(0.022)	(0.018)	(0.024)	(0.027)
$PF_{x,t-1}$	-0.012	-0.024	-0.023	0.005	-0.020
	(0.009)	(0.035)	(0.033)	(0.026)	(0.049)
$r3^*_{x,t-1}$	-0.001	0.316	0.355	-0.104	0.210
	(0.070)	(0.226)	(0.511)	(0.125)	(0.613)
$FC_{x,t-1}$			1.325		5.504
			(0.898)		(0.00058)
$SML_{x,t-1}$		10.130***	9.056*		6.390*
		(1.404)	(3.695)		(2.695)
$CU_{x,t-1}$		-5.373*			
		(2.186)			
$GROW_{x,t-1}$			1.680*		
			(0.702)		
cons	1.887**	-3.567	-4.425	3.474	-2.902
	(0.684)	(2.318)	(3.059)	(2.163)	(4.126)
N	420	420	420	420	420
AIC	104.9164	34.66514	34.52498	87.62411	37.07718
BIC	133.1982	71.02743	74.92753	119.9462	77.47972

Table 18: Augment estimation results – A sample of IMF index (88 countries)

	PL model		PRE model	
	Model 1	Model 2	Model 1	Model 2
$CA / GDP_{it,t-1}$	-0.013**	-0.012*	0.000	-0.011
	(0.005)	(0.006)	(0.012)	(0.010)
$G / GDP_{x,y-1}$	-0.030*	-0.020	-0.064	-0.032
	(0.013)	(0.022)	(0.037)	(0.025)
$OP_{x,t}$	-0.003**	-0.000	-0.008	-0.001
	(0.001)	(0.002)	(0.004)	(0.002)
$MF_{x,t}$	-0.010**	-0.017***	-0.018	-0.021**
	(0.003)	(0.005)	(0.009)	(0.007)
$PF_{x,t-1}$	0.019***	0.011*	0.032***	0.015**
	(0.003)	(0.005)	(0.007)	(0.006)
$r3^*_{x,t-1}$	0.065*	-0.060	0.147**	-0.035
	(0.030)	(0.041)	(0.045)	(0.052)
$FC_{x,t-1}$		0.173		0.105
		(0.320)		(0.299)
$imf_{x,t-1}$		2.651***		2.520***
		(0.173)		(0.206)
$GROW_{x,t-1}$		0.021		0.040
		(0.177)		(0.195)
cons	-0.815**	-0.78	-1.147	-0.762
	(0.299)	(0.429)	(0.829)	(0.574)
N	791	791	791	791
AIC	555.8204	231.7602	453.3345	310.6061
BIC	625.9199	315.8796	490.7209	362.0124

Notes: Standard errors in parentheses, * p<0.05, ** p<0.01, *** p<0.001

This section was an analysis of factors that caused the liberalization of capital flows. The analysis found that the strongest statistical factors are the political ones including existing CAL policies and liberalization policies in general. This effect is not seen with monetary stability and independence of the central bank. The second strongest factors relate to international integration. Also, this analysis provides evidence of a positive impact on economic growth and a negative impact of a currency crisis occurrence through the stock exchange market channels.

4.2.2 Empirical results of econometrics model on CAL, Financial crisis and Economic Growth- VAR panel analysis

The analysis above only considers one direction of the relationship between the CAL process and its impact on economic, political and structural factors. Also, Probit analysis does not allow investigation into the intensity of CAL changes over the years. It seems rational to employ the VAR Panel analysis, under the condition that all the variables used in the previous Probit panel analysis might have endogenous characters. The VAR panel analysis used seven different measures of the CAL intensity process.

Among all the CAL measures that were described in the previous section, I decided to focus on seven different measures, belonging to capital intensive measures, based on the IMF AREAER report ($KAOPEN_{x,t}$), Capital flow index and Interest rate index. These are employed in the VAR estimation. Among capital intensive measures based on the IMF AREAER report, the measure proposed is the Chinn and Ito (2002) index.

In order to analyse the effect of international capital flows, the most appropriate measure is the modified Kray and Swan's index and Lane/Milesi-Ferretti indexes ($IFIGDP_{x,t}$ and $GEQGDP_{x,t}$). These indexes analyse the ownership of assets or liabilities which allows the other perspective to analyse the CAL process. However, none of these measures included information about financial derivative contracts, which over time, became important and are responsible for volatility of capital flows. Consequently, financial derivative contracts are analysed through $FDL_{x,t}$ and $FDA_{x,t}$ indexes. The last type of CAL measures is direct to ICAPM and risk transfers. In order to measure this process, it is worth using Chanda's index ($CH_{x,t}$) because it has the longest possible period of estimation.

The impulse response function (IRF) is derived from the unrestricted panel-VAR in the case of the Capital control liberalization process. The analysis is done in two parts:

- i) Estimation of benchmark equation: impact of other benchmark variables on the CAL process and also the impact of CAL changes on other benchmark variable changes;
- ii) Estimation of augment specification Probit model.

A benchmark impulse response function for CAL changes confirmed the results from the Probit analysis, of a negative impact through trade shock, fiscal policy and currency accounts. However, it is notable that there are significant differences between capital flows index and the other CAL indicators (see Table 19 and Appendix Figures 1-6). However, it can be seen that the impact of CAL on other factors is mostly positive and this might suggest that the CAL process has a strong impact on simulating the economy. VAR panel augment estimation results show that liberalization of the CAL process produces a negative impact on any categories of crisis which occur, and a positive impact on stimulating the economy to higher economic growth. It suggests that the effect of the animal spirit is not so significant compared to allocative efficiency (Tables 19 and 20 and Appendix Figures 1-6).

Table 19: Benchmark equation: CAL response to shocks of other variables

Variable	CAL response to trade shock	CAL response to fiscal policy shock	CAL response to Current Account shock	CAL response to international interest shock
Chanda's index	(-)	(-)	(-) and jump up	(-)
LMF index (geogdp)	(+)	(+)	(-)	(-)
LMF index (ifigdp)	(+)	(+)	(-)	(-)
Chinn and Ito's index	(-)	(-)	(+)	(+)
Kray and Swan's index	(+)	(-)	(-)	(-)
Financial derivatives (Total Assets)	(-)	(+)	(+)	(+)
Financial derivatives (Total Liabilities)	(+)	(-)	(-)	(+)

Note: (-) negative impact, (+) positive impact, *Source:* Author's estimation based on data source described in previous section.

Table 20: Benchmark estimation equation: response of other variables to CAL shocks

Variable	Response of trade to CAL shock	Response of fiscal policy to CAL shock	Response of Current Account to CAL shock	Response of international interest rate to CAL shock
Chanda's index	(+)	(-)	(+)	(-)
LMF index (geogdp)	(+) and jump down	(+)	(+) and jump down	(+) and jump down
LMF index (ifigdp)	(+)	(+)	(-) and jump up	(+)
Chinn and Ito's index	(-)	(-)	(+)	(-)
Kray and Swan's index	(+)	(+)	(-)	(-)
Financial derivatives (Total Assets)	(+)	(+)	(+)	(+)
Financial derivatives (Total Liabilities)	(+)	(+)	(-)	(-)

Note: (-) negative impact, (+) positive impact, *Source:* Author's estimation based on data source described in previous section.

Table 21: Augment estimation equation: response of CAL to shocks

Variable	Response of CAL to financial crisis shock	Response of CAL to banking crisis shock	Response of CAL to currency shock	Response of CAL to debt shock	Response of CAL to economic growth shock	Response of CAL to previous CAL shock
Chanda's index	(-) and jump up	(-) and jump up	(-) and jump up	(-) and jump up	(+)	(-) and jump up
LMF index (geogdp)	(+)	(-)	(+)	(-)	(-)	(-)
LMF index (ifigdp)	(+)	(+)	(-)	(-)	(+)	(+)
Chinn and Ito's index	(-)	(+)	(-)	(-) and jump up	(-)	(-) and jump up
Kray and Swan's index	(-)	(+)	(+)	(-)	(-)	(+)
Financial derivatives (Total Assets)	(-)	(-)	(-)	(+)	(+)	(+)
Financial derivatives (Total Liabilities)	(+)	(-)	(-)	(-)	(-)	(+)

Note: (-) negative impact, (+) positive impact, *Source:* Author's estimation based on data source described in previous section

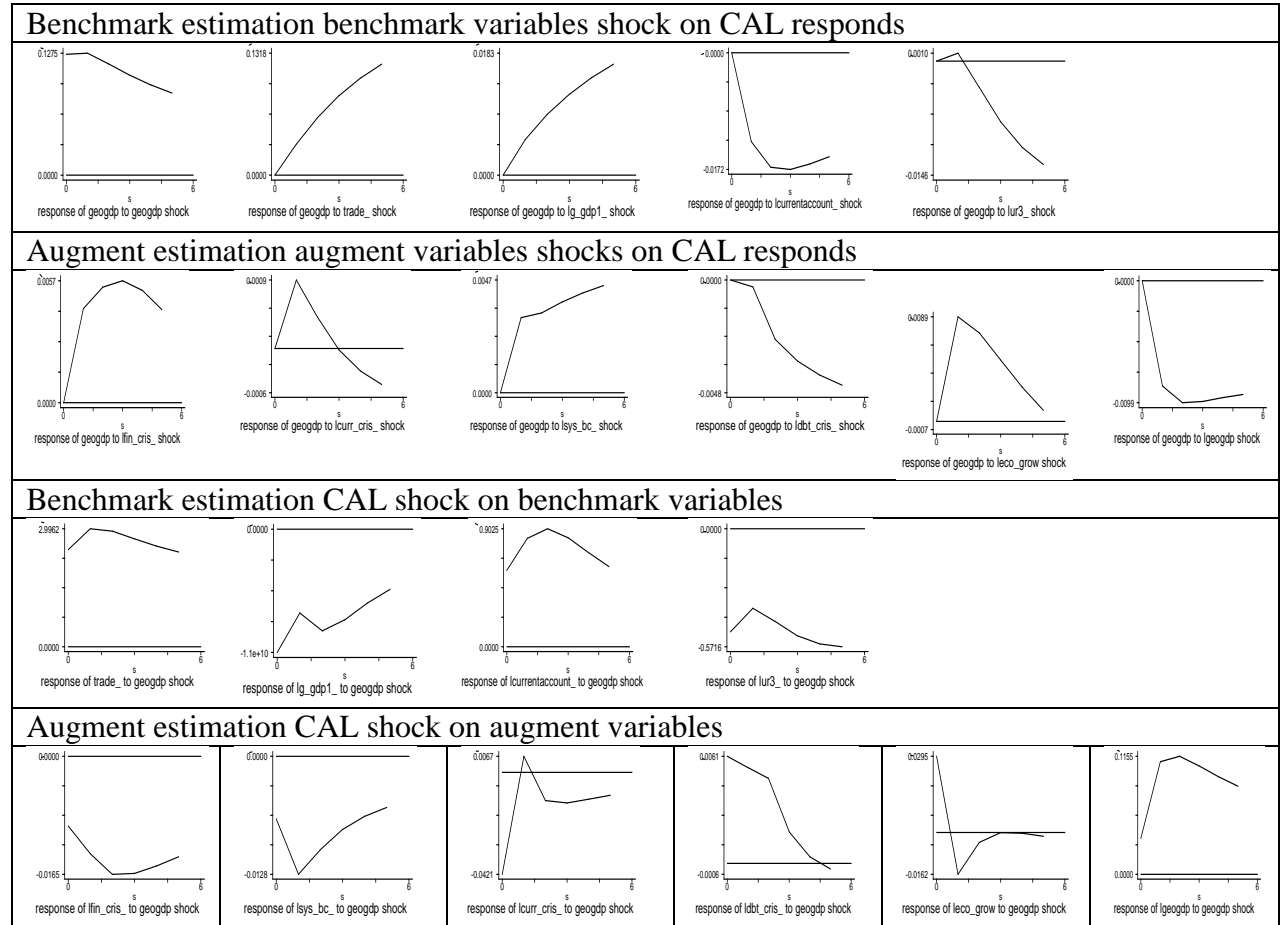
Table 22: Augment estimation equation: response of other variables to CAL shocks

Variable	Response of financial crisis to CAL shock	Response of banking crisis to CAL shock	Response of currency crisis to CAL shock	Response of debt crisis to CAL shock	Response of economic growth to CAL shock	Response of previous CAL to CAL shock
Chanda's index	(-)	(-)	(-)	(-)	(-)	(-) and jump up
LMF index (geogdp)	(-)	(-) and jump down	(+)	(-)	(-)	(-)
LMF index (ifigdp)	(+)	(+)	(-)	(-)	(-) and jump up	(+)
Chinn and Ito's index	(-)	(-)	(-)	(+)	(-)	(+)
Kray and Swan's index	(+)	(+)	(-)	(-)	(-)	(+)
Financial derivatives (Total Assets)	(-)	(+)	(-)	(-)	(+)	(-)
Financial derivatives (Total Liabilities)	(+)	(-)	(-)	(-)	(-)	(+)

Note: (-) negative impact, (+) positive impact, *Source:* Author's estimation based on data source described in previous section.

Tables 21-22 report the augmented specification, with specification of the occurrence of crises or economic growth in the preceding year and for the presence of CAL in the preceding year included as explanatory variables. These results seem to show a negative impact of financial disturbance on the CAL process. A similar result was obtained for economic growth incidences. Tables 21- 22 show the augmented specification, included as variable dummies, for the occurrence of economic growth in the preceding year and for the presence of CAL in the preceding year (see Figure 2). CAL incidences in the previous year have a positive effect on the increase of economic growth in the current year. The results from Tables 21-22 confirm that the presence of CAL in the preceding year significantly raises the probability of liberalization in the current year (Appendix, Figures 1-6).

Figure 2: Impulse Response Function (IRF) for all parameters with regard to LMF index changes ($GEQGD\hat{P}_{x,t}$) (vice versa)



Source: Author's estimation based on the data source described in previous section

Moreover, it seems that lagged CAL is the most appropriate indicator of liberalization of capital control. The other independent variables are second. It does not seem to be a surprise that the changes from one regime (capital control) to another regime (capital account liberalization), and vice versa, happens rarely (see Sulimierska, 2008b, Glick, Guo and Hutchison, 2006).

5: Conclusion

To sum up the analysis in this chapter, the analysis provides some evidence of a positive relation between CAL and economic growth episodes. Especially, this effect seems to be as strong as the descriptive statistical analysis suggests. Then, the Probit model estimation shows that there is a negative effect of currency instability, which can reduce the economic growth effect through stock exchange market channels. There is no evidence, through probit estimation, of a direct impact from other types of crises on the CAL process - which provided mixed results, with respect to the negative impact of animal spirits on the CAL process through a financial instability channel.

However, VAR analysis indicates there is a negative impact of financial disturbance on the CAL process. It seems that cross-country analysis does not provide conclusive answers to the problem. However, it seems to be clear that the character of the CAL process is a political decision rather than an economic one and provides little evidence of allocative efficiency as results of benchmark estimation suggested.

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Appendix

Table 1: The CAL measure implementation in the empirical analysis

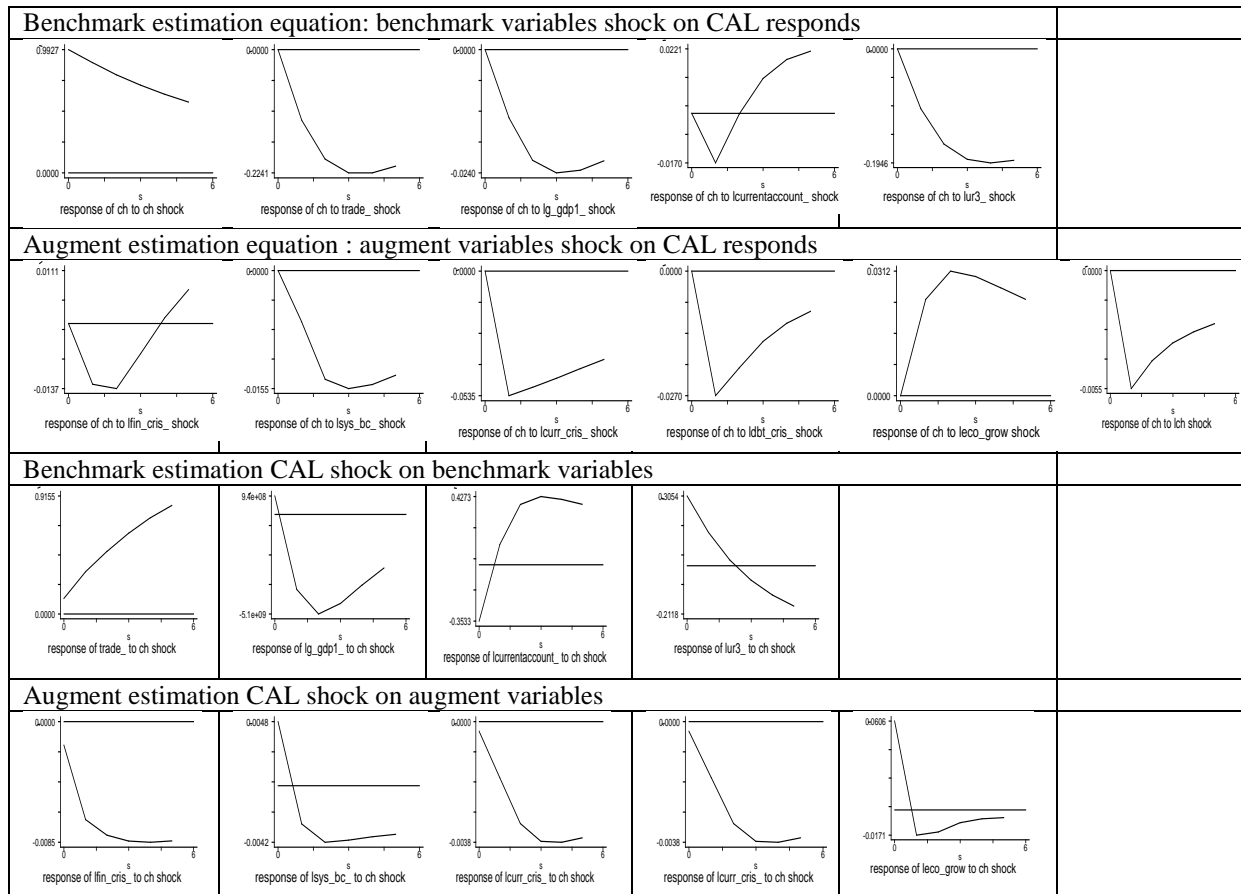
Index name	Data sources
Rules –based measures	IMF’s AREAER
IMF measures	
Binary measures (on-off measures): E2 line, Glick, Guo and Hutchison (2004), Sulimierska (2008b)	
Intensity measures(Intensity of the controls IMF index which is based on IMF’s AREAER) Chinn and Ito (2002, 2007) Mody and Murshid (2004) Quinn (1997)	Chinn and Ito database ²⁶ IMF’s AREAER Bekaert, Campbell and Harvey (2005)
Other binary measures: SML policy approach index	Kim and Singal (2000), Henry (2000a, b, 2003), Bekaert and Harvey (2002c, 2005), Chari and Henry (2000a, b), Bekaert, Campbell and Harvey (2005), Henry and Sasson (2008), Patro and Wald (2005)
Quantitative measures International Capital Flows Kray (1998), Swan (1998), Chanda (2001, 2005) Lane, Milesi-Ferretti (2001, 2003, 2006a)	IMF’s BoP, World Bank’s database, National sources, External Wealth of National Database - Milesi-Ferretti (2001, 2003, 2006a)
Interest rate differentials and assets prices integration Assets prices integration index SML policy-continuous approach and SML continuous approach SML mixed approach index	Kim and Singal (2000), Henry (2000a, b, 2003), Bekaert and Harvey (2002c, 2005)
Interest rate differentials index Chanda (2001, 2005)	Economic Freedom of the World: 2000 Annual Report by Fraser Institute.

²⁶ http://web.pdx.edu/~ito/Chinn-Ito_website.htm

Table 2: Description of control variables and data sources

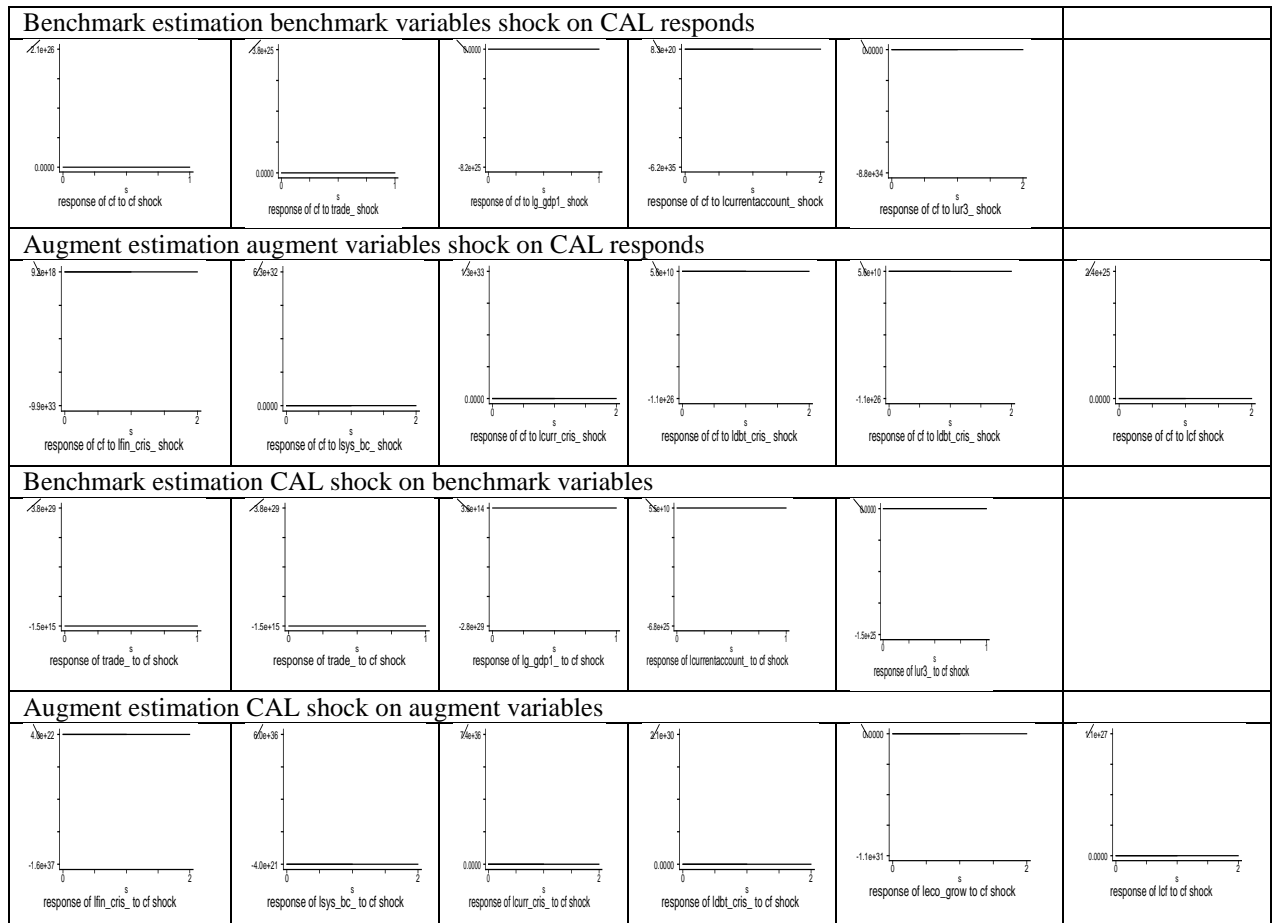
	Variables	Descriptions	Sources
Macroeconomic variables	$CA/GDP_{t,x}$	Current Account as percentage of GDP	Trade Sift WDI
	r_{it}^*	The real international interest rate -USA central bank policy rate (IFS line 60zf) (Units: Percent per Annum) -The discount rate for the year minus the ex post CPI inflation rate over the past year (IFS line 60 b..zf (Federal Funds rate -Units: Percent per Annum) minus the percentage change in line 64 ..xzf CPI% change -Unite: Percent).	International Monetary Fund's CD International Financial Statistics CD
Economic structure variables	$G_{t,x}$	Government consumption as the percentage of GDP: $G1_{t,x}$ -Government consumption, national currency, constant (WB estimation) [code: 29925] as GDP at market prices, national currency, constant prices, (WB estimation) [code:29916]	United Nations Common Database Trade Sift WDI
	$OP_{t,x}$	Openness to world trade -sum of export and import of goods and services as a percentage of GDP.	Trade Sift WDI
	$MF_{t,x}$	Monetary independence variable -“Monetary freedom” index with range between 0 and 100. The higher value is linked to higher level of monetary stability with respect to inflation and penalty for inflation.	Economic Freedom index from Heritage Foundation
Political variable	$PF_{t,x}$	Political freedom- “Corruption freedom” index with range between 0 and 100. The higher value is linked to higher level of corruption based on CPI index.	Economic Freedom index from Heritage Foundation
	$GROW_{t,x}$	Economic growth indicator is defined as “1”- economic growth or, alternatively, “0”-no economic growth. If $\frac{GDP_{x,t} - GDP_{x,t-1}}{GDP_{x,t-1}} > 5\%$ then $ECO_GROW_{t,x}=1$ and vice versa. The calculations used GDP at market prices, national currency, constant prices, (WB estimation) [code: 29916] from United Nations Common Database. Data was available from 1994 up to 2006 for 193 countries. After first calculating the differences the country analysis sample is closed for period 1995 up to 2005.	United Nations Common Database

Figure 1: Impulse Response Function (IRF) for all parameters with regards to Chanda's index changes (vice versa)



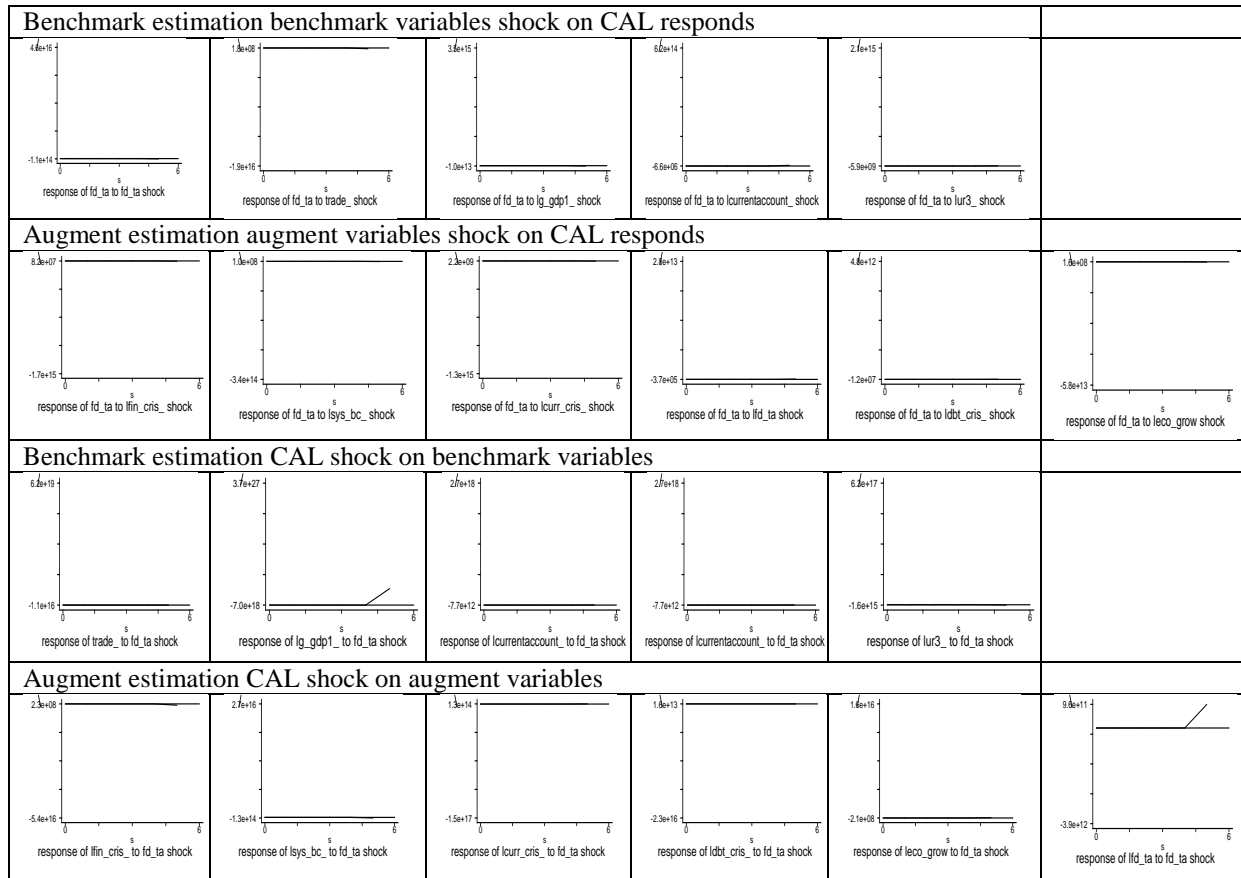
Source: Author's estimation based on the data source described in previous section

Figure 2: Impulse Response Function (IRF) for all parameters with regards to CF index changes (vice versa)



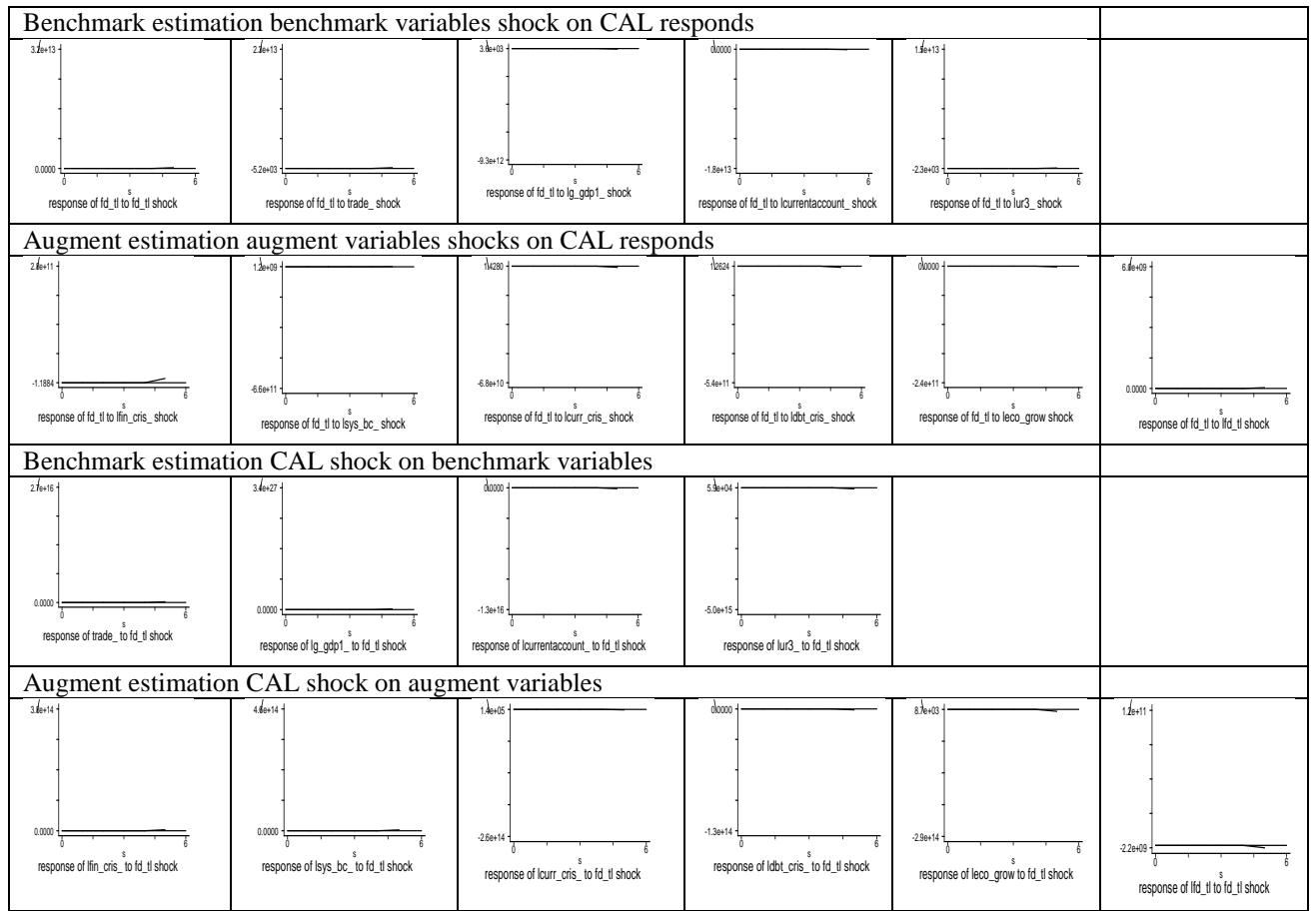
Source: Author's estimation based on the data source described in previous section

Figure 3: Impulse Response Function (IRF) for all parameters with regards to Financial Derivatives of Total Assets index changes (vice versa)



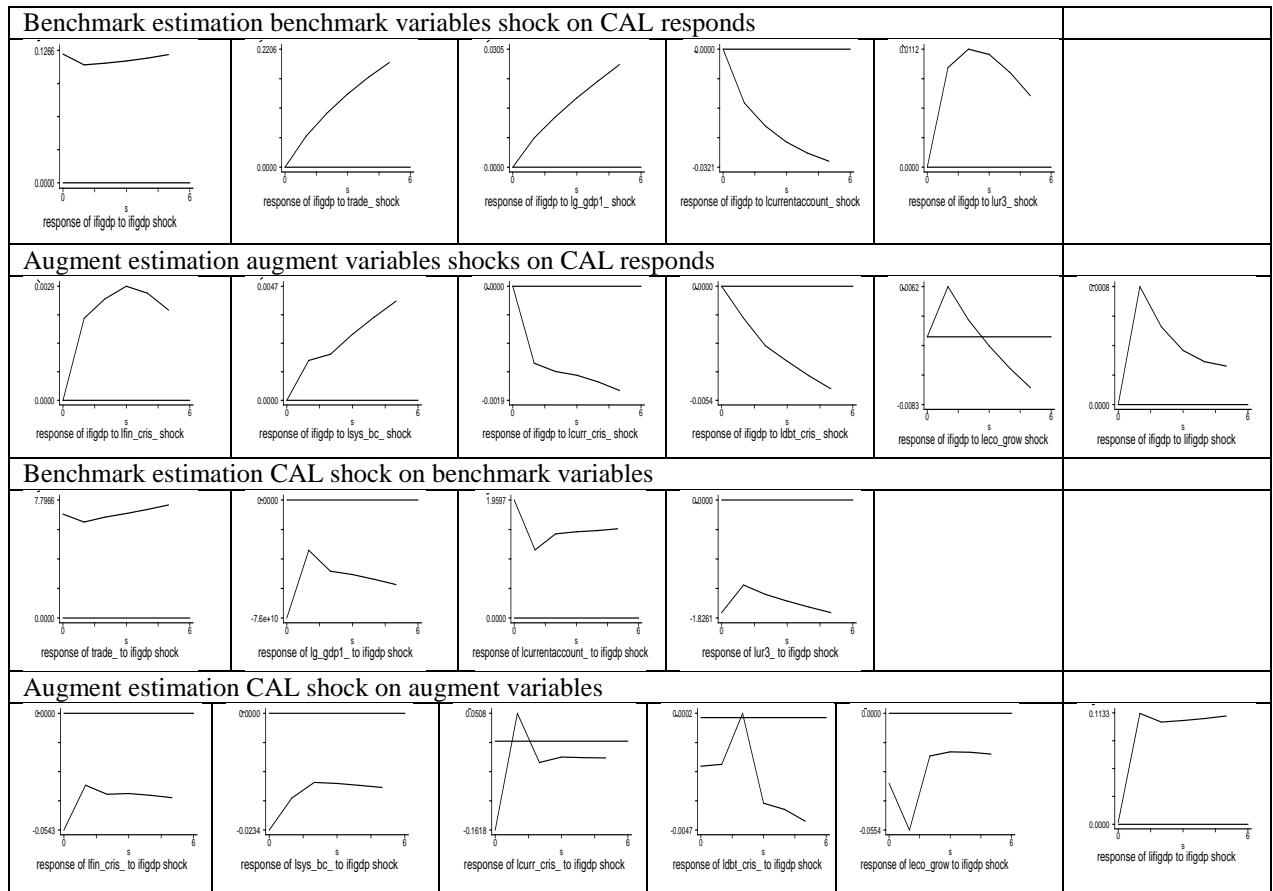
Source: Author's estimation based on the data source described in previous section

Figure 4: Impulse Response Function (IRF) for all parameters with regards to Financial Derivatives of Total Liabilities index changes (vice versa)



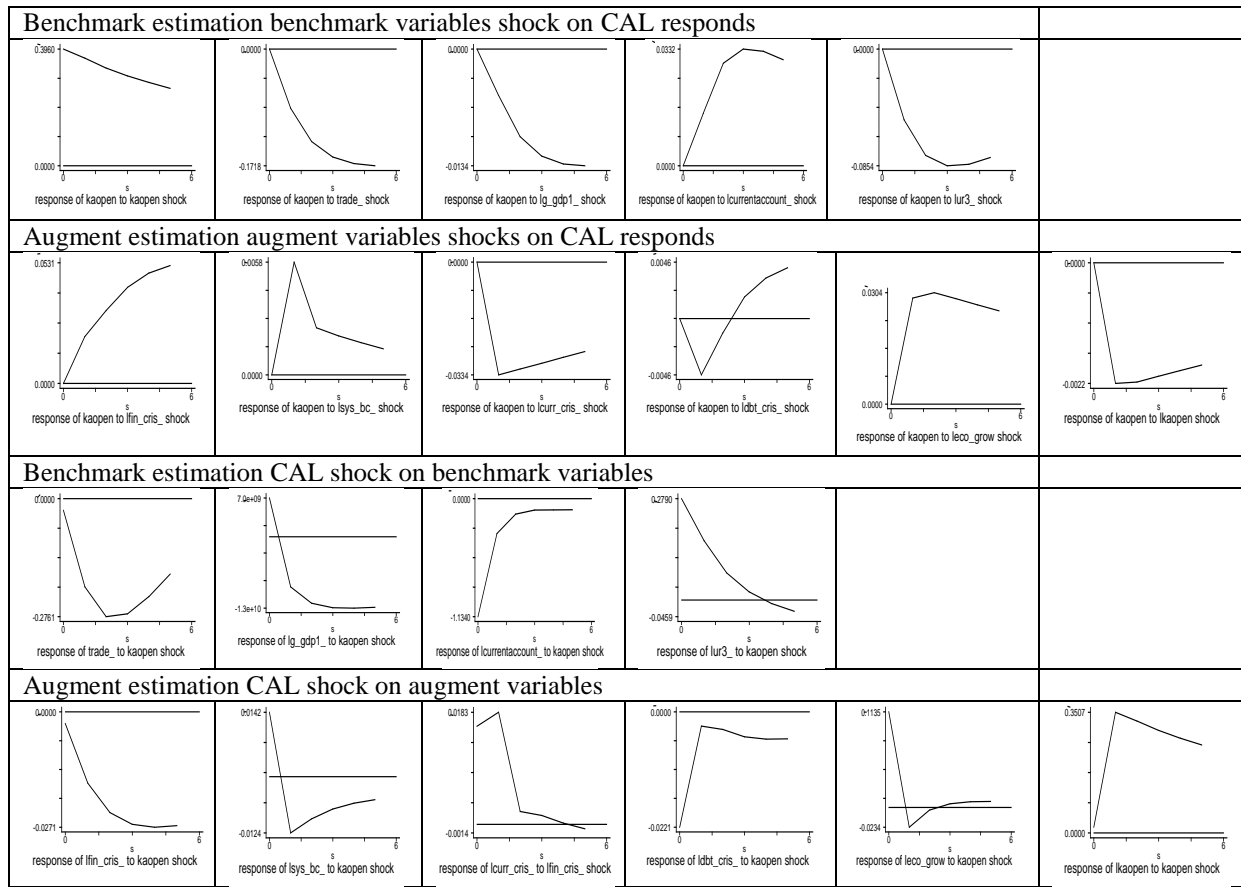
Source: Author's estimation based on the data source described in previous section

Figure 5: Impulse Response Function (IRF) for all parameters with regards to LMF index changes (ifigdp) (vice versa)



Source: Author's estimation based on the data source described in previous section

Figure 6: Impulse Response Function (IRF) for all parameters with regards to Chinn and Ito's index (kaopen) (vice versa)



Source: Author's estimation based on the data source described in previous section