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**Foreign Financial Deregulation under Flexible and Fixed  
Exchange Rates**

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## **Summary**

An enhanced Mundell-Fleming model with domestic and foreign banking deregulation is considered for a small open economy. Deregulation is assumed to influence net capital outflows. It can be shown that under fixed exchange rates, foreign deregulation reduces output and employment and therefore there will be an international resistance to strong deregulation abroad - typically in the US or the UK whose big banking sectors could give an inherent incentive to deregulate. Under flexible exchange rates, banking deregulation abroad raises output and employment so that banking deregulation in the US – or the UK - will face less resistance than under a system of fixed exchange rates; excessive deregulation pressure could emerge in a system of flexible rates. There is a new trilemma. While banking deregulation might bring a national and global output increase in the medium term, the long-run effects could be higher government restructurings cost related to ailing banks in OECD countries. The debate of fixed exchange rates versus flexible exchange rates thus has a new additional aspect, namely the probability of banking deregulation. A key policy implication derived is thus that in a system of flexible exchange rates national and international as well as IMF monitoring of banking regulation quality is important for economic stability and welfare – the IMF's FSAP and the work of the BIS are quite crucial. BREXIT allows one to expect a wave of deregulation in the UK (plus US); with negative external effects worldwide. New long-run effects are also considered in an enhanced Solow growth model with risk, trade and FDI.

## **Zusammenfassung**

Ein erweitertes Mundell-Fleming-Modell mit in- bzw. ausländischer Bankenderegulierung wird für eine kleine offene Volkswirtschaft betrachtet. Deregulierung beeinflusst erfahrungs- und annahmegemäß die Nettokapitalabflüsse. Es lässt sich zeigen, dass im System fixer Wechselkurse Banken-Deregulierung Produktion und Beschäftigung im Modell für das Inland vermindert, was zu internationalem Politikwiderstand gegen Bankenderegulierung im Ausland führen wird – also etwa mit Blick auf US- oder UK-Bankenderegulierungsabsichten. Bei flexiblen Wechselkursen hingegen erhöht ausländische Deregulierung Einkommen und Beschäftigung, so dass Banken-Deregulierung in den USA (oder UK) zu weniger Widerstand in anderen Ländern führt als im System fixer Kurse. Es gibt ein neues Trilemma. Während Banken-Deregulierung ggf. national und global Einkommenserhöhung auf mittlere Sicht bringen kann, könnten die langfristigen Effekte in hohen regierungsseitigen Restrukturierungskosten für insolvente Banken. Die Debatte zu Fixkurs- versus flexibles Wechselkurssystem hat damit eine neue zusätzliche Perspektive, nämlich die globale Neigung zur Bankenderegulierung. Eine Schlüssel-Schlussfolgerung lautet daher, dass es im System flexibler Wechselkurse sehr darauf ankommt, national und international eine hohe Qualität der Bankenaufsicht im Interesse von Einkommensdynamik und Wohlfahrt zu sichern; dies gilt auch für die IMF-seitige Prüfung nationaler Finanzsysteme via Financial Sector Assessment-Programm, für das, wie bei der BIZ-Arbeit, hohe Qualität zu gewährleisten ist. Der BREXIT lässt eine neue Finanzmarkt-Deregulierung in UK erwarten – Ähnliches ist in den USA wahrscheinlich: jeweils mit negativen internationalen externen Effekten. Auch Langfristeffekte werden betrachtet in einem erweiterten Solow-Modell Risiko, Handel und Direktinvestitionen.

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# 1. Introduction

In the aftermath of both the Transatlantic Banking Crisis and the Euro Crisis there has been a broad macroeconomic discussion about the rationality of financial markets and market participants, respectively; and the need for governments in many OECD countries to undertake costly interventions through various policy measures needed to stabilize the respective banking systems and the overall economy. There has also been a new rift between the political elites in the US and the UK and the respective electorates as it seems doubtful that policymakers are able to control the actions of big banks and leading financial market participants – nationalist and populist forces have gained ground in some OECD countries and indeed the IMF's Annual Economic Outlook in 2016 mentioned the risk of political instability in OECD countries as a rather new crucial phenomenon. What has, however, not been discussed to any large extent is the question of what has nurtured – beyond the interests of individual big banks (with banks often in competition with big, aggressive and unregulated hedge funds in the US and Europe, respectively) – the strong deregulation in banking in the UK and the US over decades. The following analysis develops a new argument that is related to the systemic incentives of flexible versus fixed exchange rates: (foreign) deregulation is considered to be strongly linked to the inherent incentives generated under flexible exchange rates. The analytical framework to explain this is the well-established Mundell-Fleming model that has been quite useful for the international macroeconomic debate in many respects (survey: OBSTFELD, 2001).

The Mundell-Fleming model has been very useful in analyzing fiscal and monetary policy under fixed and flexible exchange rates where the basic message is that monetary policy is not effective under fixed exchange rates so that fiscal policy is to be preferred for achieving internal equilibrium (full employment); under flexible exchange rates monetary policy is more appropriate as a policy instrument to raise output and employment. For the case of fixed exchange rates, MUNDELL (1971, Monetary Theory, Chapter 9) makes an important analytical point that the relative price of tradables is crucial for the current account balance – an aspect which, for example, has been picked up by OBSTFELD/ROGOFF (2005) in their theoretical and empirical analysis of the US current account deficit problems where the authors showed that an internal depreciation of 1 percent – a rise of the tradables price relative to the non-tradables price – has an impact on the current account balance that is twice as large as that of a real depreciation of 1 percent.

The more recent macroeconomic analysis has emphasized the New Keynesian Economics and the role of rational expectations – forward-looking behavior - in combination with market imperfections and transaction costs. While this is a useful analytical modernization, some key issues have not been really analyzed and indeed have not been fully understood: The Transatlantic Banking Crisis came as a surprise to most economists (with a few notable exceptions, such as RAJAN, 2005; ARTUS/VIRARD, 2005): the massive banking crises in the US and the UK were largely caused by strong banking deregulation initiatives in the UK during the 1980s and in the US during the 1990s and financial innovation waves. ARTUS/VIRARD (2005) point out that the rise of the required rate of return on equity in the US leads to higher stock market prices of US banks which in turn facilitates transatlantic M&As in the European banking sector and thus indirectly puts pressure on banks in Europe to also adopt the high required rate of return; this is one important

mechanism through which foreign deregulation spills over to other countries in a system of flexible exchange rates. These authors, however, do not mention the additional critical point that foreign deregulation (banking deregulation in the US) will bring about a real appreciation of the US dollar and this in turn should reinforce US banks' pressure on banks in Europe which face an increased threat for leveraged transatlantic mergers and acquisitions. The Transatlantic Banking Crisis has caused the Great Recession in Western OECD countries and this as well as other shocks have caused major adjustment pressures in many countries of the world economy. As regards adjustment dynamics, the IMF (2016) – and as a background CORSETTI/KUESTER/MÜLLER (2016) – has emphasized that flexible exchange rates have helped to find a new equilibrium in most countries after the Great Recession. This conjecture, however, is not really convincing if one takes into account the inherent link between the exchange rate regime, financial deregulation and instability. It can be shown in an enhanced Mundell-Fleming model that foreign banking deregulation – from an Asian or continental European perspective: read banking deregulation in the US or the UK – reduces output and employment under fixed exchange rates while under flexible exchange rates output and employment are raised through banking deregulation abroad. This implies that the international resistance against banking deregulation in countries with leading banking markets will be quite modest in a system of flexible exchange rates and hence there is a rather strong risk that excessive banking deregulation will occur and indeed cause destabilization of the world economy at high costs.

Certainly the empirical links between deregulation and international capital flows are of interest:

- As regards the empirical evidence between financial deregulation and capital flows, PACZOS (2016) provides evidence on the link between gross capital flow reactions to financial sector deregulation for a panel of 91 countries between 1980 and 2005: financial sector deregulation is associated with an average increase of 2 to 3 percent in both gross capital inflows and outflows, the dynamic reaction of gross capital flows is found to be J-shaped; disaggregated flows show that short-term dynamics are governed only by debt flows whereas long-term dynamics are driven by both debt, portfolio equity and foreign direct investment flows. This, however, does not present evidence against net capital inflows into countries with banking regulations with a dominant financial center.
- Looking at the experience of France with its banking deregulation in the 1980s, the empirical evidence suggests that this has amounted to bringing about efficiency gains in the real economy (BERTRAND/SCHOAR/THESMAR, 2007). Clearly, if an initially overregulated country moves towards a carefully designed appropriate system of prudential supervision and banking regulation, respectively, there can be positive effects on economic growth and this in turn should generate higher net capital inflows. Will there be a tendency towards an adequate level of regulation at the global level? This should depend to a large extent on the countries with big financial systems, i.e. the US, the UK and very few other countries.

Why should there be a tendency for excessive deregulation at all? In many countries, big banks stand for powerful actors in capital markets and also enjoy good contacts to the political system. That system itself has an interest in low real interest rates as governments in most OECD countries face rather high debt-GDP ratios (with the exception of a few countries such as Luxembourg and Switzerland; outside the EU, a notable case is that of

Singapore which is quite remarkable in that it has had high budget surplus positions over many years). Under fixed exchange rates, the inflation rate in OECD countries is largely determined by the policy of the anchor country, read: the US. As long as inflation rates are considerable, say between 3-10 percent, the real interest rate will be fairly low. In a system of flexible exchange rates there is national monetary policy autonomy so that responsibility for high inflation rates would be quite obvious – hence flexible exchange rates system should have fairly low inflation rates; not least because high inflation rates will lead to nominal exchange rate depreciations that are politically unpopular. However, in a low inflation environment, politicians in some countries are then all the more interested in having low nominal interest rates as a basis for low real interest rates. The fact that the wealth-income ratio in OECD countries tends to increase over time lets one expect that the role of big banks/big financial service providers will increase over time and thus the banks' pressure for deregulation could increase over time while at the same time there will not be much resistance at home and – as will be shown – abroad. In a setting with big banks – assuming 'too big to fail' is a relevant perspective for many big banks – the incentive for such banks to push for excessive deregulation is fairly obvious. Rather restrictive rules for banking and financial services firms will be unpopular with banks, but also with voters, namely if such rules undermine economic growth and perspectives for new jobs. Whether or not political decision-makers are able to adopt adequate reforms in the field of prudential supervision is unclear. After the Transatlantic Banking Crisis more restrictive rules have been adopted, but it is, for example, not convincing to have the CoCo bonds of banks – CoCo bonds means contingent convertible bonds - placed in capital markets (bonds which become equity capital once critical indicators of the respective bank have been violated) without restrictions on other banks buying such bonds. Without such restrictions a systemic crisis would probably not find much external equity capital injections into the system so that the stabilization properties of CoCo bonds might be rather weak. At the same time, it is clear that not every measure of deregulation represents a dangerous development.

The fact that flexible exchange rates, dating back only to 1973, are useful as shock absorbers – and indeed reinforce the responsibility of national monetary policy – is not very encouraging if flexible exchange rates also create a systematic tendency towards excessive deregulation and potentially high instabilities: analyzing systemic propensity for deregulation and indeed temporarily excessive banking deregulation has thus far not been part of International Macroeconomics and this is quite problematic. In a nutshell: what would be – to consider a possibly extreme perspective – the purpose of having more national monetary policy autonomy under flexible exchange rates if the excessive deregulation that goes along with flexible exchange rate systems in the end forces central banks into extreme policy interventions, including years of Quantitative Easing; the latter triggers so many political counter-arguments that the undermining of Western central banking independence already seems to be underway in key countries. To the extent that flexible exchange rate systems are not combined with high-quality prudential supervision in both OECD and BRICs countries, there is considerable risk that the next international banking crisis will emerge and indeed result in the massive criticism of central banks which then could quickly lose political independence (or switch to a lower degree of independence); with the further consequence of a return to high inflation rates soon afterwards as central banks will come under pressure to renounce the goal of price

stability. The institutional shift of prudential supervision to central banks following the banking crisis of 2007-09 in the US, UK and Eurozone could seriously backfire on central banks in the next international financial crisis.

One should not overlook the fact that deregulation can be a Pareto-superior policy measure if there was overregulation before, however, it is also clear that there could be excessive deregulation in the UK or in the US or indeed in some other economies with a leading global financial market place. Since under flexible exchange rates the other countries will face a real devaluation of the currency, it will be all the more easy for UK or US banks to take over banks in the Eurozone as deregulation brings the advantage of a rise of the real banking stock market value while the real devaluation of the Euro and other currencies in continental Europe and Asia facilitate international mergers & acquisitions of banks in continental Europe and Asia by US banks or British banks; the incipient takeover pressure will then motivate European and Asian banks to also push for deregulation – in Asia, including Japan, governments would be hesitant to acquiesce to such pressure since the memory of the 1997/98 Asian Crisis, in which insufficient banking supervision had played a role, is rather fresh.

The subsequent contribution picks up on the familiar “trilemma” of fixed exchange rate regimes which says that fixed exchange rates, open capital accounts and independent monetary policy cannot coexist. This has been the analytical basis – with empirical evidence contributed for the trilemma by OBSTFELD/SHAMBAUGH/TAYLOR (2004) – upon which to argue for systems of flexible exchange rates; and in some cases for international capital controls. Subsequently, this perspective is turned around and it is asked how the exchange rate system affects the impetus for banking/financial market deregulation. In a system of fixed exchange rates this is mainly a question for deregulation in the anchor country, whereas in a system of flexible exchange rates the pressure for deregulation should be expected in any mayor country with a relatively big and advanced financial sector; possibly a particular issue in periods of rather low growth when big banks and other financial service providers could easily lobby for deregulation as a means to reduce the cost of capital and thus the raise economic dynamics in the medium term. Whether or not national and international economic development is favorably influenced in the long run by financial deregulation is a second question and requires analysis within a growth model.

Given the experience with partly excessive UK deregulation in the 1980s and US deregulation in the 1990s, one may at first point out that the costs of excessive UK/US deregulation were very high to the extent that the collapse of Northern Rock in the UK in 2007 (with an incipient bank run) and the bankruptcy of Lehman Brothers on September 15, 2008, nearly brought about a collapse of the western OECD countries. The strong fall of the output trend after 2008 observed in the US, the UK, the Eurozone and Canada is remarkable – see appendix 1 with data from PICHELMANN (2015); but it should not simply be argued that this measures the cost of the Transatlantic Banking Crisis. Rather, one has to take into account that artificially low risk premia in the US in 2003-06 (GOODHART, 2008) will have contributed to artificially high output growth in the US and other OECD countries; and the same argument is valid with respect to the UK and other OECD countries. Hence the level of the growth path of 2003-08 was too high and thus only part of the observed reduction in the level of the growth path of western OECD countries stands for true long-run costs of excessive deregulation and the Transatlantic

Banking Crisis of 2007-09. Additional costs from massively expansionary fiscal policy and bank rescuing operations, as well as the massive fall of tax revenues relative to GDP and thus, at the bottom line, an historical increase in public debt-GDP ratios in peacetime in western economies could be observed – effectively undermining the ability for future fiscal policy.

The new trilemma for flexible exchange rates stated here says that one cannot have adequate banking/financial market regulation, free capital flows and flexible exchange rates simultaneously. It will be argued that the system of flexible exchange rates has a tendency for excessive deregulation and that free capital flows indeed will encourage net capital outflows to countries with such deregulation and thereby reinforce the ability of foreign banks in countries where deregulation has started to impose pressure on other countries' banks to also lobby for deregulation: the real appreciation of the currency in the deregulation pioneer countries will, in a global system of imperfect capital markets, facilitate that banks in other countries can be taken over – a special case of the more general argument of FROOT/STEIN (1991) who argued that countries with a real devaluation will experience higher net capital inflows for international merger & acquisitions as the devaluation raises the equity capital of foreign investors eager to take over firms (or banks, as one may emphasize here). This holds unless there are restrictions on capital inflows in countries facing such capital inflows from countries with excessive deregulation where banks will not only benefit from artificially high stock market prices but also from the real appreciation of the currency which effectively is like an international subsidization of instability-generating FDI outflows in the banking sector. These macroeconomic mechanics stand for a new trilemma, namely whether one can have flexible exchange rates, adequate international prudential supervision/regulation of banks and free capital flows.

The fact that the near-collapse of western economic systems in late 2008 has been followed by about eight years of re-regulation and “optimizing” financial regulations in the US and the EU seems to indicate that there could be adequate deregulation or optimal regulation of banks, however, in a historical perspective, these eight years represent a very short time period and in the US the Trump administration has already started to push for new deregulation (via less cooperation in the BIS for Basel III implementation and also national deregulation, for example, by eliminating the living will instrument newly established as an institutional innovation to avoid major banking crises in the future. Moreover, it can be argued that the government in the UK will rather soon also push for new deregulation as a means to raise output growth that will be reduced for about a decade through BREXIT. The BREXIT itself can be shown to be largely related to the banking crisis since this crisis raised the deficit-GDP ratio to a peak of 11 percent in the UK which in turn resulted in the Cameron government placing a strange emphasis on anti-EU immigration rhetoric which seems to have been politically necessary in order to create a useful scapegoat for the consolidation measures of cutting fiscal transfers to local communities by 3.5 percentage points of GDP within five years: while the OECD analysis shows that EU immigrants stand for a net contribution to the British government budget, Mr. Cameron's anti-immigration rhetoric suggested that one group be blamed for enormous cuts in the provision of local public services. EU immigrants apparently were to blame for the fact that a broad under-provision of local services could be observed in the UK after Prime

Minister Cameron's massive cuts in fiscal transfers; for more details on this, see WELFENS, 2017a).

BREXIT, by reducing medium-term growth, will push the UK government to adopt measures intended to raise output growth and there is not much doubt that beyond cuts of corporate tax rates, a new round of deregulation in banking /financial markets is likely; once there is excessive deregulation in the UK (or the US), there is a high likelihood for a vicious circle since – this is the main point in the subsequent analysis frame in an enhanced Mundell-Fleming model – the partner countries of the US/UK have no incentive to resist such deregulation: the medium-term impact of foreign deregulation (in the US/UK) is an expansion of output in continental EU countries/European countries. Whether western democracies will survive another big Transatlantic Banking Crisis may be doubted, at least there are considerable risks in the system of flexible exchange rates that thus far have not been considered. The narrative presented so far is the background for a simple and straightforward macro model with foreign and domestic deregulation under fixed and flexible exchange rates. Deregulation will be treated as being equivalent to a liberalization of capital flows – and there is no full liberalization or a full substitutability of assets of the home country and the foreign country considered in the enhanced Mundell-Fleming model. Such substitutability indeed can never be 100 percent across all tradables and financial assets unless country 1 and country 2 are part of the same country/political governance structure, which would be a contradiction in itself. It will be argued that there will be a parallel upward shift of the balance of payments equilibrium curve in the model, however, one could, of course, also consider deregulation elements that could change the slope of the curve as well as shifting it. As will be shown, the effect of foreign deregulation under fixed exchange rates is negative on output and employment, whereas it is positive under flexible exchange rates. One may point out that adequate foreign deregulation (in country 1) may increase medium-term output  $Y^*$  which in turn could stimulate the exports of country 1, however it is quite unlikely that deregulation is always optimal and, secondly, the empirical effect could be insufficient to change the negative output effect under fixed exchange rates. In the system of flexible exchange rates any induced increase of  $Y^*$  from foreign deregulation will only reinforce the lack of potential resistance against excessive deregulation in the US (or the UK). One can, of course, not fully exclude that a US partner country – say a country like Canada – is wise enough not to imitate sweeping US deregulation; such policy wisdom indeed could be observed in Canada in the first decade of the 21st century and Canadian banks were among the winners in North American banking markets after the collapse of Lehman Brothers. In the end, one should not exclude that deregulation policy can be rather differentiated and indeed contribute in a useful and sustained way to competition and efficiency.

However, one should also not overlook that reality has generated apparently excessive deregulation in the US and the UK. It is also true that the Mundell-Fleming model is a rather simple approach for modelling international spillovers from foreign banking deregulation. If one accepts the assumption that there is a considerable likelihood that the system of flexible exchange rates encourages excessive deregulation – has a systemic bias not to bloc such deregulation –, one should be interested also to look into the long-run effects of higher risk on output in an enhanced growth model with trade and foreign direct investment. The result again is clearly negative and indeed the new approach presented

allows to consider a battery of policy instruments, but this is only one element of financial market deregulation in the UK and the US, respectively.

One paradoxical aspect of the discussion in Economics is that RAJAN (2005) in his presentation at the Jackson Hole meeting of central bankers did highlight two critical points regarding recent financial globalization, but not many central bankers followed the arguments of Mr. Rajan at that time, namely that the securitization of private sector loans drastically reduced the incentive for banks to engage in a careful risk analysis of the respective loans given – but already earmarked for selling on to other investors in the capital market. Mr. Rajan also emphasized the problem of herding behavior created by similar bonus payment schemes in major financial firms and banks in western OECD countries. These perspectives are crucial, but one should also raise the question of to what extent the flexible exchange rate system creates itself a bias for more deregulation.

The subsequent analysis sheds new light on the questions:

- How does foreign deregulation affect partner countries' GDP and employment, namely under fixed exchange rates versus flexible exchange rates (the basis is a medium-term enhanced Mundell-Fleming model)?
- What are the key implications of the finding that flexible exchange rates encourage the international deregulation of banks and financial markets – possibly with a tendency towards excessive deregulation?
- Why – taking into account BREXIT and the new Trump administration in the US – is excessive deregulation rather likely and what long-term costs should one expect?
- What are the long run per capita effects of excessive deregulation and higher market risk in OECD countries' financial markets (the basis here is a new growth model with trade, foreign direct investment and risk as well as income taxes and VAT rates)?
- Which policy options should be considered for the sake of a rational strategy?

The following modified Mundell-Fleming model considers the role of (foreign) banking deregulation and comes up with clear new insights. The inherent risk of excessive banking deregulation under flexible exchange rates is considerable and therefore it is all the more important that policymakers keep a critical eye on national, international as well as supranational/multilateral deregulation where the latter is the field of the Bank for International Settlements. One may also argue that the issue of cross-border spillovers from macroprudential policy – for example, in the Eurozone (BUCH/GOLDBERG, 2016; NOCCIOLA/ZOCHOWSKI, 2016) – is quite important from an analytical policy perspective, but this is rather complementary to the new systemic perspectives shown here.

While flexible exchange rate regimes are often considered to reduce macro adjustment costs in the presence of adverse shocks, the flexible exchange rate system might indirectly endogenously contribute to more financial market instability in OECD countries – through a strong tendency towards banking deregulation – so that the net stabilization properties of flexible exchange rates are not clear and the ability of the multilateral system to generate consistent rules for the prudential supervision of banks and thus a level playing field in world capital markets may also be doubted. The expectation of BIS member countries that the Bank for International Settlements will, with its rule book (Basel I, II and now III – the latter as of 2019), help to bring about a global level playing field has been weakened under

the Trump administration which has effectively started to block Basel III in late January 2017. One may raise the question of whether the US and the UK – after BREXIT - are about to embrace a new round of banking deregulation and what the effects will be on the world economy; including future negative external effects on the stability of Eurozone financial markets and the stability of (adequate) debt-GDP ratios. The banking crisis of 2007-09 has raised the debt-GDP ratios of OECD countries greatly as several governments had to stabilize national banking systems through costly nationalizations or equity capital injections; and expansionary fiscal policy came with considerable deficits on top of this. The following analysis first develops a modernized Mundell-Fleming model and then takes a closer look at the policy implications, including some issues related to BREXIT. Moreover, new key insights from long run growth analysis are obtained in the context of an enhanced Solow growth model with real money balances, trade, foreign direct investment, infrastructure capital and risk. At the bottom line, critical policy conclusions can naturally be derived.

## **2. A Macro Model of an Open Economy with Foreign Financial Deregulation**

Foreign deregulation of banks will be considered and it may be assumed that the government of the country which introduces the relevant deregulation aims at raising efficiency and innovativeness in the banking sector and the “financial industry” so that the prospects for innovation and growth in the overall economy will be raised in the medium term. If such deregulation occurs in the US, there will be additional transatlantic European (or Asian) capital outflows that could either reflect portfolio aspects related to reducing portfolio risk through transatlantic (or transpacific) diversification; or there could be additional transatlantic (or transpacific) foreign direct investment flows towards the US whose attractiveness for entrepreneurial investment has been enhanced through the deregulation. It should also be noted that the deregulation of banks in the US and the UK will raise the profits of American and British banks, respectively, which indeed could explain a rise of net capital inflows. To the extent that financial deregulation is stimulating competition, efficiency and innovation in the real economy, there are also incentives for foreign investors to invest more in the country with financial deregulation. Subsequently, a relative deregulation variable ( $D/D^*$ ) is considered since the main focus here is on (foreign) deregulation effects. This definition of the relevant variable of deregulation could be adjusted – indeed considering the impact of  $D$  and  $D^*$  separately – in order to carefully look into aspects of international deregulation spillovers which, however, will not be considered here. It is also clear that the Mundell-Fleming model is not ideal for analyzing intertemporal policy perspectives. However, for the key aspects emphasized in the subsequent research, the Mundell-Fleming approach is indeed quite useful.

As regards the additional portfolio investment outflows from Europe (or Asia) to the US/UK, the points emphasized are to make clear that the main aspect is not one of a general increase of the investment flows related to the difference  $i-i^*$  ( $i$  is the nominal interest rate,  $i^*$  is the US interest rate) as such a change typically would make the balance of payments equilibrium line in the Mundell-Fleming model flatter; this would correspond



to an increase of the parameter  $V'$  in the subsequent analysis and then the main effects to be considered would indeed depend on whether or not the initial situation of the small open European (or Asian) economy to be considered is characterized by net portfolio capital inflows (associated with  $i > i^*$ ) or net capital portfolio outflows ( $i^* > i$ ); this traditional aspect has been analyzed (e.g. CLAUSEN, 2002). Deregulation in the US – foreign deregulation (actually, relative to domestic deregulation) – is assumed to trigger additional net capital outflows as explained, namely related to short-term portfolio risk considerations or to broader foreign direct investment (FDI) aspects. Subsequently, it is not only these additional international capital flow effects related to foreign banking deregulation which are analyzed under fixed and flexible exchange rates. It will indeed be argued that the flexible exchange rate system creates a bias in favor of more US and international banking deregulation and as for the politico-economic reasons, it may be assumed that there will be excessive deregulation pressure – for example, reflecting big banks' strategic pressure for deregulation in an environment with 'too big to fail' problems in the banking system – there is a new trilemma: one cannot have a flexible exchange rate system, free capital flows and adequate banking regulation (and *a fortiori* independent national monetary policy in continental European countries). Instead, there is excessive US/UK deregulation in the banking sector which then has deregulation spillover effects to many continental European countries and the banking crisis realized in the medium term will then bring about such a deep economic crisis that monetary policy in the Eurozone is effectively forced to adopt the same Quantitative Easing policy that the US has adopted to stabilize its banking system; the fact that Canada did not follow US deregulation moves in the 1990s suggests that while the dynamics sketched here could happen, under fortunate circumstances they could be avoided – but a global monetary system that is not inherently stable is not convincing in terms of institutional quality. The subsequent analysis explains the inherent mechanism.

Let us consider a simple Keynesian macro model of a small open economy with regulation of financial markets. The degree of bank deregulation ( $D$ ) in country 1 (home country) and country 2 is an additional policy variable in the model developed. It will be assumed that net capital inflows are a positive function of relative deregulation  $D/D^*$  ( $*$  denotes foreign variables). A fall of  $D$  – meaning lower effective banking regulation - is thus equivalent to a rise of  $D^*$ . Hence, if the degree of banking deregulation abroad is raised, there will be a higher capital outflows – say from the UK or Sweden or Switzerland or the Eurozone to the US provided that it is the US government's decision to raise the degree of deregulation.

The three equations to be considered are the goods market equilibrium condition (1), the money market equilibrium condition (2) and the foreign exchange market equilibrium condition (3). Consumption demand is assumed to be represented by  $C = c(1-\tau)Y - s'\tau'Y - c''\tau''$ , where  $\tau$  is the income tax rate,  $\tau'$  the value-added tax rate and  $\tau''$  the exogenous expected future income tax rate ( $0 < c < 1$ ;  $s' > 0$ ,  $c'' > 0$ ). Investment  $I$  is assumed to depend positively on the level of technology  $A$ , product innovation ( $v$ ) and the difference between the marginal product of capital  $MPC$  and the real interest rate  $r$ ; the positive link between  $I$  and  $v$  is assumed since typically new products can only be produced with new capital equipment. As output is assumed to be  $Y = K^\beta (AL)^{1-\beta}$ , the marginal product of capital is equal to  $\beta Y/K$  ( $K$  is the capital stock,  $A$  knowledge,  $L$  labor input and employment, respectively;  $0 < \beta < 1$ ; parameters in the subsequent investment function:  $b > 0$ ,  $b' > 0$ ,  $b'' > 0$ ).

The model allows to consider the role of banking deregulation, but also the role of product and process related innovations (an increase of A) as well as the VAT rate and income tax rate changes. The main focus here is on the role of deregulation abroad ( $D^*$ ) and at home (D). Issues of VAT rate changes in an open economy with trade and foreign direct investment flows are considered in WELFENS (2017b).

Exports are assumed to be a positive function of foreign GDP ( $Y^*$ ), the real exchange rate ( $q^* := eP^*/P$  where  $e$  is the nominal exchange rate and  $P$  is the domestic price level) and the relative rate of product innovation ( $v/v^*$ ;  $x''$  is a positive parameter). Imports are proportionate to  $Y$  and a negative function of  $q^*$  and of  $v/v^*$  ( $j''$  is a positive parameter). For the sake of simplicity it is assumed that the elasticity of exports  $X$  with respect to  $q^*$  is unity and that the elasticity of imports with respect to  $q^*$  is  $-1$ . It is also assumed that exports are a positive function of the VAT rate  $\tau'$ , while imports are a negative function of  $\tau'$  (parameters  $x' > 0$ ;  $j' > 0$ ). Hence net exports  $X'$  expressed in domestic goods units is equal to  $xY^*q^* + x'\tau' + j'\tau' + x''v/v^* - jY - j''v/v^*$  (imports in domestic goods units are  $q^*J$  where  $J$  is the amount of physical import units and  $J = jY$ ;  $x > 0$ ,  $0 < j < 1$ ); exports in real terms is  $X = xY^*q^* + x'\tau' + x''v/v^*$ . For the money market equilibrium (with  $M$  for the stock of money,  $P$  for the price level,  $r$  is the real interest) one may write  $M/P = hY/(h'r) = h''Y/r$  (with  $h'' := h/h'$ ). Expected inflation is assumed to be zero. To the extent that one wants to consider the policy option of a VAT rate change, it is adequate to replace  $M/P$  by  $M/(P_0(1 + \tau'))$  where  $P_0$  is the initial equilibrium price level.

Net capital imports can be written as  $V'(r-r^*) + v'(D/D^*) + v''q^*$ ; hence the condition for an equilibrium in the foreign exchange market is given by  $V'(r-r^*) + v'(D/D^*) + v''q^* = jY - (j' + x')\tau' - (j'' + x'')v/v^* - xY^*q^*$ ;  $V'$ ,  $v'$  and  $v''$  are positive parameters. Hence  $v'(r-r^*)$  is the basic portfolio capital inflow, the term  $v'(D/D^*)$  indicates additional net capital inflow that depends on the relative degree of deregulation; the higher  $D/D^*$  is, the higher is this type of capital inflow that obviously will focus on a higher expected yield in a deregulated banking system; and  $v''q^*$  reflects the argument of FROOT/STEIN (1991) that in imperfect international capital markets, foreign direct investment inflows – in the form of mergers and acquisitions – are a positive function of the real exchange rate.

The equation system is as follows for the case of a small open economy:

$$(1) Y = c(1-\tau)Y - s'\tau'Y - c''\tau'' + b(\beta Y/K - r) + b'v + b''A + G + xY^*q^* - jY + (j'' + x'')v/v^* + (x' + j')\tau'$$

$$(2) M/(P_0(1 + \tau')) = hY/(h'r); \text{ if } \tau' \text{ is rather small the RHS can be written as } M(1 - \tau')/P_0$$

$$(3) V'(r-r^*) + v'(D/D^*) + v''q^* = jY - (j'' + x'')v/v^* - xY^*q^* - (x' + j')\tau'$$

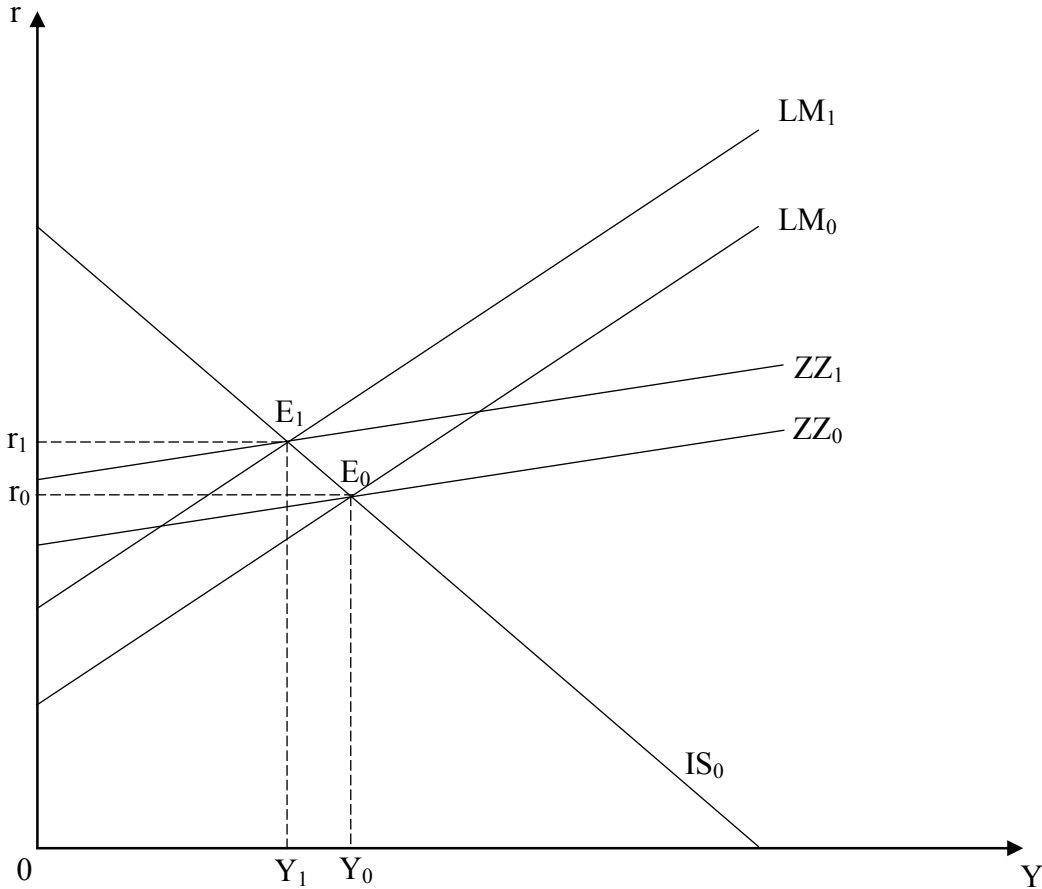
This model is much richer than a traditional Mundell-Fleming model. As regards the role of product innovation on the trade balance and some aspects of process innovation, it may be emphasized that these topics were, to some extent, already considered in WELFENS (2011; and for an empirical view on innovation dynamics in Europe and implications for

the welfare aspects of transatlantic trade liberalization, see JUNGMITTAG/WELFENS (2016)).

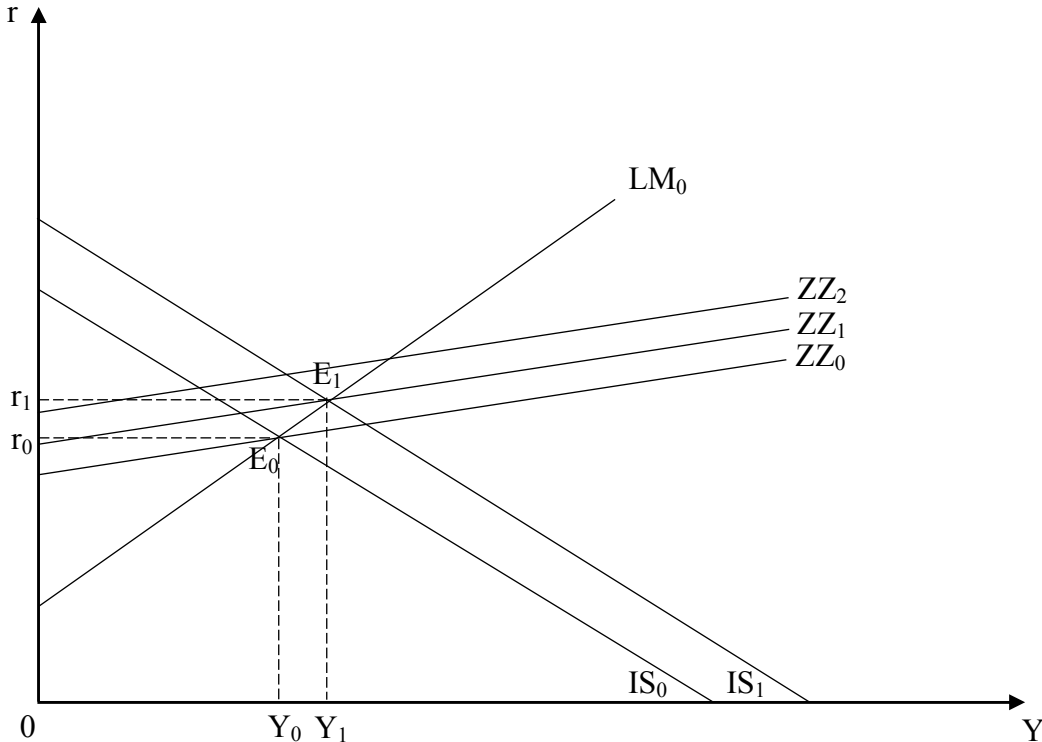
### **3. Policy Analysis and Multipliers for Flexible and Fixed Exchange Rates**

Under fixed exchange rates, a rise of the foreign deregulation index will raise net capital outflows so that the ZZ line – the equilibrium line for the foreign exchange market – in  $r$ - $Y$  space will shift upwards. Hence there will be an excess demand for foreign exchange and the central bank will have to sell reserves so that the LM curve shifts to the left as the money supply declines through the intervention. The endogenous variables are  $Y$ ,  $r$  and  $M$ . As a comparison of the initial equilibrium ( $E_0$ ) and the new equilibrium (point  $E_1$ ) shows (Fig. 1): the real interest will increase ( $r_1$ ) and output is reduced ( $Y_1$ ). Hence foreign financial deregulation has a negative effect on output and employment in country 1 and this should make country 1 (2, 3...N) inclined not to easily accept foreign deregulation: resistance against such deregulation will be strong. In the medium term, there will be – after some adjustment time – an additional effect as the foreign GDP ( $Y^*$ ) will increase if financial market deregulation brings higher investment and consumption and therefore an output increase abroad which, in turn, will stimulate exports of country 1. A specific medium-term problem for country 1 could be that the real stock market price of banks in the deregulated country will increase which will make it easier for them to take over banks in country 1 through leveraged international mergers and acquisitions. These potential and actual M&As will put pressure on other countries' banks to also lobby for banking deregulation in the hope that such deregulation raises those banks' asset prices and makes them less attractive and thus the chances of being subjected to an international M&A less likely.

**Figure 1: Foreign Banking Deregulation under Fixed Exchange Rates**



**Figure 2: Foreign Banking Deregulation under Flexible Exchange Rates**



Under flexible exchange rates there will be an upward shift of the ZZ-curve (Fig. 2) if the relative foreign deregulation intensity indicator in the banking sector is raised, so that the original equilibrium point  $E_0$  then stands for an excess demand for foreign exchange. As a consequence, there is a devaluation of the real exchange rate ( $q^* := eP^*/P$ ) and therefore a rightward shift of the IS curve – portraying goods market equilibrium - through higher net exports of goods and services (assuming that the Marshall-Lerner condition holds); the balance of payments equilibrium schedule ZZ will also shift downwards into the position  $ZZ_2$  after the real devaluation so that the initial effect from the fall of  $D/D^*$  in the context of a foreign banking deregulation (rise of  $D^*$ ) is dampened. At the bottom line there is a positive real output effect (compare  $Y_1$  and  $Y_0$ ). Output and employment in country 1 are raised in the medium term as a consequence of foreign banking deregulation so that the resistance of other countries – say European/Eurozone countries facing US banking deregulation – is much weaker than in the case of fixed exchange rates.

Therefore, one may argue that flexible exchange rate regimes, the new reality since 1973, will go along with more pressure for banking deregulation in leading countries of the OECD. The massive deregulation in the UK in the 1980s and later in the US is fully in line with this theoretical argument – it does not rule out that the established regulation had indeed been too strict from a normative perspective of optimum regulation, but the point is that with big banks and other sectors pushing for banking deregulation in the UK or the US, the world's leading reserve currency country, there is some risk of excessive deregulation and the medium-term macro effects in OECD partner countries (or in Asia and Latin America) will not generate critical resistance. Rather, with higher output and employment an international policy attitude which is pro-deregulation could easily emerge. Excessive deregulation could in turn generate high long-term macroeconomic costs as the banking crisis of 2007-09 has shown; not only in Europe but also in the US (and the UK) as the main source country of the banking crisis itself. One should not forget: in 2008, the US Economic Stimulus Act brought an expansionary fiscal impulse of 1.2 percent of GDP – slightly larger than the typical fiscal expansion program; the packages in 2009 and 2010 were even larger again, namely 2.1 percent and 2.4 percent of GDP, respectively. There is also a high deficit-GDP ratio associated with this which was partly reinforced through a revenue gap element related to the big recession connected to the confidence shock from the bankruptcy of the Lehman Brothers bank. Compared to this, the fiscal stimulus in EU countries was rather modest, namely 1.1 percent of GDP in 2009 and 0.8 percent of 2010. With debt-GDP ratios in the US and the UK – and some other EU countries – rising strongly in the Great Recession, the future room to maneuver with regard to fiscal policy has narrowed.

The multipliers from the above equation system can be calculated where at first one may consider a system of fixed exchange rates (with endogenous variables  $Y$ ,  $r$ ,  $M$ ; see appendix 2 for the differentiated equation system and the relevant system determinant). In the case of a system with flexible exchange rates, and hence the endogenous variables  $Y$ ,  $r$ ,  $q^*$ , we also can calculate key policy multipliers (appendix 3).

## **4. Long-Run Theoretical Perspectives in an Enhanced Monetary Growth Model with Trade, Foreign Direct Investment, Infrastructure Capital and Risk**

The long-run effects of foreign deregulation under a flexible exchange rate system is a rising problem of international systemic risk – a problem that in the EU the European Systemic Risk Board should carefully consider with an adequate analytical framework. The degree of risk in the Eurozone (and the EU) might be approximated by the CISS indicator (and adequately modified versions) developed at the ECB (HOLLO/KREMER/LO DUCA, 2012).

It is not easy to define a long-run growth model – for which the savings function as well as the production function are key elements - that is largely compatible with the medium-term Keynesian analysis of an economy with under-utilization of capacity. The long run full employment approach in the context of the enhanced Solow model developed here for an open economy with trade and (cumulated) inward foreign direct investment is, however, rather straightforward as the savings function used for the long run is largely the mirror of the consumption function used in the Mundell-Fleming model except for the variable of expected income tax rate which is suppressed now; in addition GDP is replaced by national income  $Z = (1 - \alpha^* \beta)Y$  where  $\alpha^*$  is the share of K owned by foreign investors and  $\beta$  is the share of profits of private capital owners in gross domestic product; and since capital accumulation will partly reflect investment from foreign subsidiaries, a reinvestment parameter of multinational subsidiaries is also considered ( $s''$ ;  $s'' > 0$ ). In order to have at least some basic monetary element in the growth model, real money balances are considered as a production factor (output elasticity is  $\beta'$ ;  $0 < \beta' < 1$ ), and as regards fiscal policy, at least one basic element is integrated here in the production function, namely the government infrastructure capital stock  $K'$  (output elasticity is  $\beta''$ ;  $0 < \beta'' < 1$ ; it is assumed that all deficits are used for financing the public capital stock which has a zero depreciation rate. Knowledge (A) is assumed to grow at a constant rate  $a$ , the population grows at a constant rate  $n$ . It is assumed that the export intensity  $x$  as well as the import intensity  $j$  have a positive impact on the level of the growth path while “expected financial instability”  $\sigma$  - related to the degree of financial deregulation (the link might be negative in a situation of overregulation, but beyond a certain degree of deregulation more deregulation brings more expected instability) – has a negative impact on the level of the growth path; the parameters  $\sigma'$ ,  $\varphi'$  and  $\varphi''$  are positive. It can be shown that a higher risk in markets will shift up the marginal cost curve of firms in the real economy so that at the macroeconomic level there is a negative link between risk and GDP.

One may debate whether or not  $\sigma$  should also affect savings (and whether the sign is positive or negative as discussed in WELFENS, 2011); for the sake of simplicity it is assumed here that the long-run savings can be written without a term reflecting the degree of uncertainty. In the macro production function, risk has a negative effect which could actually reflect the fact that in an economy with risks in markets, the rise of risk shifts all marginal cost curves upwards. In the following enhanced production function real money balance (M/P), infrastructure capital  $K'$ , the private capital stock K and knowledge A as

well as labor  $L$  are the key input factors while trade intensity and risk are additional elements that are introduced in a way that a closed economy without risk is characterized (with  $0 < \beta < 1$ ) by the production function  $Y = (M/P)^{\beta} K^{\beta} K^{\beta} (AL)^{1-\beta-\beta}$ . Hence for the open economy – with  $x$ ,  $j$  and  $\sigma$  denoting the export intensity, the import intensity and risk, respectively - with risk we have as the production function (WELFENS, 2017b):

$$(4) Y = \{(1 + \varphi'x)(1 + \varphi''j) (1 - \sigma'\sigma)(M/P)^{\beta} K^{\beta} K^{\beta} (AL)^{1-\beta-\beta}\}$$

As regards the link between export intensity/trade intensity and output, one may argue that this can be explained by specialization gains; as regards imports in particular, one may emphasize intermediate imports (and embodied foreign technology), as regards exports one may also point to the argumentation of MELITZ (2003) who has emphasized that in a setting with heterogenous firms, exporting firms stand for above-average technological abilities and advanced product quality, respectively.

The implication clearly is that long-run equilibrium output is negatively affected by risk. The steady state solution (#) for  $y' := Y/(AL)$  can be written – with  $m' := (M/P)/(AL)$  – in a rather compact way (see appendix 4;  $\tau$  is the income tax rate,  $\tau'$  the VAT rate,  $n$  is the growth rate of the population,  $a$  the growth rate of knowledge,  $\delta$  the rate of private capital depreciation,  $\delta'$  is the ratio of public investment to GDP,  $c$  and  $c'$  are positive parameters):

$$(4') \ln y' \# \approx (1/(1-\beta-\beta''))(\varphi'x + \varphi''j - \sigma'\sigma) + \beta'/(1-\beta-\beta'') \ln m' + \beta''/(1-\beta-\beta'') \ln(\delta'/(a+n)) + (\beta/(1-\beta-\beta''))[-c - \tau + c\tau + c'\tau\tau' + \alpha*\beta((s''-s(1-\tau)-c'\tau\tau')) - \delta'] - \ln(a+n+\delta)]$$

The elasticity of  $y' \#$  with respect to risk is given by  $-\sigma'/(1-\beta-\beta'')$  which is negative as long as  $\beta + \beta'' < 1$  (in an empirical perspective this condition will hold as  $\beta$  is about 1/3 in most studies on OECD countries and  $\beta''$  is likely to be somewhat smaller due to a rather “general specialization” embodied in infrastructure). Excessive deregulation means that  $\sigma$  has increased and this will reduce the level of the growth path; on top of this could come additional side-effects through a negative influence of risk on  $x$  and  $j$ , respectively. In principle there could also be an impact on the long-run money market whose equilibrium – assuming zero expected inflation – can be written as  $M/P = hY/(h'(r + \sigma''\sigma))$  or simply  $m' = h''y'/(r + \sigma''\sigma)$  where  $\sigma''$  is the price of risk;  $h'' := h/h'$ . Hence in the long-run equilibrium solution for the goods market and  $\ln y' \#$ , respectively, one could replace  $\ln m'$  by  $\ln h'' + \ln y' - \ln(r + \sigma''\sigma)$  and consider in addition risk pricing aspects from the money market equilibrium.

The enhanced growth model shows in the above equation many new parameters to be taken into account by modern economic policy in OECD countries. A comparison of long-run model solutions and the Keynesian medium-term insights could be quite useful for policymakers as well as for market participants since rational expectations can hardly be discussed in a realistic way without considering long-run aspects. One may also point out that the long-run government budget constraints will read  $\gamma \# y' - [\tau + \tau'c(1-\tau) - c'\tau\tau']y' = \delta'y'$  where  $\gamma \#$  is government consumption expenditure. It should also be noted that in the steady state, the deficit-GDP ratio is not set as zero since all deficits reflect public

infrastructure investment – and hence all government bonds reflect the public investment stock.

Taking a closer look at the savings function and other aspects, one gets a rather complex solution for the steady state capital intensity as is shown in appendix 4, but does not need to be discussed here in detail. However, the appendix indeed shows how rich the policy menu – including the income tax rate and the VAT rate - is in a monetary growth model with infrastructure capital fully financed from government deficits that are assumed to have a constant ratio ( $\delta'$ ) to GDP. Additional aspects and a solution for the steady state – assuming that households' savings are proportionate to GNP – can be derived (appendix 4).

## **5. Policy Implications at the National and International Level**

The compact modeling exercise of a foreign banking deregulation has shown that the effects will differ in the home country, namely depending on the foreign exchange rate regime. While CORSETTI ET AL. (2016) and the IMF (2016), respectively, have argued that flexible exchange rate systems help to absorb international shocks more effectively than a system of fixed exchange rates, one should not overlook that the system of flexible exchange rates endogenously is likely to generate more impulses for financial market deregulation in leading industrialized countries; excessive or inadequate financial market deregulation could in turn lead to a less stable international financial system and whether or not the combined effects of a less stable system and a systemically higher ability to accommodate shocks swiftly (IMF argument) amount to a better overall economic performance is unclear and should be on the agenda for future research.

With BREXIT the UK will come under considerable economic pressure (WELFENS, 2017a) and its three main policy options to generate more growth seem to be the following:

- to increase the number of free trade treaties – with rather favorable prospects in respect to the US and Japan;
- to reduce corporate tax rates in order to attract higher foreign direct investment and to stimulate the investment of domestic firms;
- to increase financial deregulation.

Given the high share of financial services in the respective national incomes, both the UK – and the US – will aim at increasing the degree of banking deregulation after 2016. For the EU27 countries this will be a serious challenge, on the one hand as one will not want to follow a similar ideological or economic approach as the US and the UK in banking deregulation. At the same time, this US & UK banking deregulation will raise the real gross domestic product and employment in the Eurozone and the other EU27 countries. This medium-term effect is not necessarily the most decisive effect of deregulation.

One may argue that the findings presented call for careful and critical evaluation of banking deregulation in all IMF member countries. Thanks to the Financial Sector Assessment Program (FSAP), which was introduced after the Asian crisis, there is a basic



policy monitoring approach available. The fact that the IMF FSAP from mid-2006 on Ireland (IMF, 2006) was unrealistic and over-optimistic indeed suggests that the quality of certain FSAP missions have a problem; a few years before, the FSAP on Switzerland argued that the big UBS had no problems while the Credit Suisse seemed to have problems – the banking crisis of 2007-09 clearly showed different findings for the UBS and the Swiss banking system, respectively.

To get a better understanding of the intertemporal problem of foreign excessive banking deregulation, it is useful to consider a simplified government budget constraint where tax revenue consists of income tax revenues and VAT rate-related tax revenues from value-added taxation that falls on consumption. Let us assume that for government there will be banking restructuring costs in  $t+1$  if the foreign deregulation has parallel spillover effects that destabilize the banking system; the cost parameter  $\gamma'$  and  $\gamma''$  indicate the government's bank system restructuring cost from deregulation that exceeds optimal  $D^*$  abroad (denoted here  $D'^*$ ) and the optimal  $D$  at home, respectively (denoted here  $D'$ ). One may also consider specific VAT collection costs where the cost parameter is  $V''$  while the cost parameter for income taxation is  $V'$  on the side of government. Thus an implicit complete government budget constraint that would include the discounted bank restructuring costs in  $t+1$  can be expressed as follows (assuming the absence of government bonds and deficits, respectively; if one includes deficits, the Domar formula for the long-term debt-GDP ratio  $D''/Y = \text{deficit-GDP ratio}/\text{trend growth rate}$  would bring a link to the tax rate through  $rD''/Y$  as the interest burden of government):

$$(5) \tau Y + \tau'(c(1-\tau)Y - s'\tau'Y) = G + (\gamma'D'^* + \gamma''D')/(1+r) + V''\tau' + V'\tau$$

The deregulation cost will bring about a rise of the income tax rate or the VAT rate. A rise of the VAT rate may have a paradoxical effect in the sense that the positive effect on net exports could dominate the consumption-dampening effect. It is easily seen that one can calculate a VAT revenue-maximizing VAT rate. However, the potential additional problem that  $Y$  is a negative function of both the income tax rate and the VAT tax rate is ignored here and could be considered in future research with a focus on the more long-term effects. If one assumes that the VAT rate is given, it is easy to calculate the income tax rate that is necessary to balance the effective shadow budget once there is a rise of  $D'^*$  or  $D'$  (and there could be indeed an international spillover effect in the sense that  $dD'/dD'^* > 0$ ). In the end one may argue that there is an endogenous nature of flexible exchange rates not least through the deregulation opportunities implicitly created by such a system for banks of leading OECD countries. In future research one also could consider both outward and inward foreign direct investment.

As long as the ratio of wealth to income is rather modest – as in the 1950s and 1960s – the role of banks relative to other sectors is rather small. However, with a long-term rise of the wealth to income ratio, the incentives to lobby for banking deregulation will become bigger. This in turn does not need to become a serious economic problem as long as national and international prudential supervision is strict and adequate. With the UK facing BREXIT and a long-term dampening of output growth (HM TREASURY, 2016) the incentives for government and leading sectors, including the strong banking sector in

London, to push for financial deregulation have increased. At the same time, the US Trump administration has envisaged partial banking deregulation as it is assumed that the rather strict regulatory regime enacted after the banking crisis of 2007-09 raises the cost of lending and thus could weaken US growth prospects. A combined US-UK deregulation of banks would put strong pressure on Eurozone countries and other EU countries to also weaken prudential supervision standards. If, in addition to weakening the BIS, the Trump administration should weaken the IMF and the FSAP procedures, respectively, the world economy is likely to face a new boom-bust cycle with high potential costs in a future new transatlantic and global banking crisis.

Another important question concerns the quality of international cooperation in prudential supervision, particularly cooperation within the BIS in the context of Basel III rules. Here the apparent reluctance of the US administration under President Trump to support technical work on Basel III – a problem observed since February 2017 – stands for a serious problem with respect to the goal of achieving a high quality of consistent, internationally networked prudential supervision (opaque statements of the Trump administration raise the degree of uncertainty in OECD countries and worldwide).

### ***Need to Reconsider the Perspective of Small Open Economies and International Deregulation Policy Spillovers***

While the small open economy macro model is useful in many ways it is misleading if a policy measure of one leading OECD economy (or of China) leads to parallel effects in very many small economies. For example, the UK and the US, respectively, adopted banking deregulation in the 1980s and 1990s which each led to a devaluation of the currencies of about 20 small and medium-sized continental EU economies so that there is an increase of EU countries' exports to the US. If one takes all EU countries together (or the Eurozone countries), one should not consider the small open economy model since a parallel response in the context of a national currency devaluation – before 1999 – means that all continental countries' exports to the UK and the US, respectively, will increase and the increase of a “synthetic small country group” (continental EU countries) will bring about a fall of the world market price and the UK/US tradables price index. From the perspective of continental EU countries, banking deregulation in the UK and the US amounts to higher capital outflows to the UK and US, respectively, but also to a dampening of inflation abroad. If one assumes that banking deregulation will translate into rising foreign real GDP, the medium-term feedback effect to the continental EU countries is that exports will increase in the context of a rise of the British and - roughly a decade later – of the US GDP. The US (and the UK) in a two country model perspective would then get a positive output feedback from continental EU countries whose imports from the US (and the UK, respectively) will increase so that continental EU countries output is rising which, in turn, will stimulate US exports (and the UK exports, respectively).

If the financial market dominance of the UK is strong in key market segments, for example for risk pricing of all EU28 countries, inadequate and inappropriate prudential supervision in the UK in this field will have an apparently positive effect since artificially low risk premiums in the UK (measured as the UK corporate bond yield of AAA-rated British firms relative to yield on government bonds) will bring overinvestment in both the UK and the continental EU countries and hence an artificial boom; the price for which – in a historical

perspective - society will have to face later during a serious banking crisis 2007-09 after which the expansion path of potential output has shifted downwards strongly (PICHELMANN, 2015; see Figure 1 for the US, Canada, the UK and the Eurozone: appendix 1). For the US risk pricing dynamics from 2003-06 a similar distortion is observed (GOODHART, 2008).

The logical response of continental EU countries facing distorted risk pricing and hence ultimately negative long-run output spillovers should have been to impose capital controls which, however, would be quite unpopular among OECD countries for many reasons. However, it is clear that under-regulation in major OECD countries that creates negative output effects in partner countries should face a policy response in the form of a Pigou tax from these countries; or broad international cooperation in prudential supervision – with adequate standards - is maintained. Given the broad interest in free international capital flows, it is all the more important that multilateral cooperation in prudential supervision through the Bank for International Settlements is of crucial relevance. A functional BIS active in that field is the rational basis for free international capital flows. From this perspective, the US under the Trump administration should be encouraged strongly by EU countries and other partner countries to take a constructive role in the Bank for International Settlements.

At the bottom line, the case for flexible exchange rates is less compelling than it has been argued so far unless one can get the IMF to really implement careful and very professional FSAP analysis in all its member countries. This field of IMF work and BIS work deserves special attention from the IMF/BIS member countries as well as from deeper scientific analysis in the future. The creation of the Eurozone has several advantages as well as some problems which became visible in the Euro Crisis; the Euro area implicitly creates less exchange rate flexibility for the global system and it thus reduces the probability of excessive deregulation. The Eurozone, assuming that it can be reformed to become a functional monetary union – possibly with the ECB creating ECB bonds in the future if deemed necessary for monetary policy (following the example of the Korean central bank and the central bank of China) – could generate useful pressure vis-à-vis the US and the UK not to embark upon excessive deregulation of banks in the future.

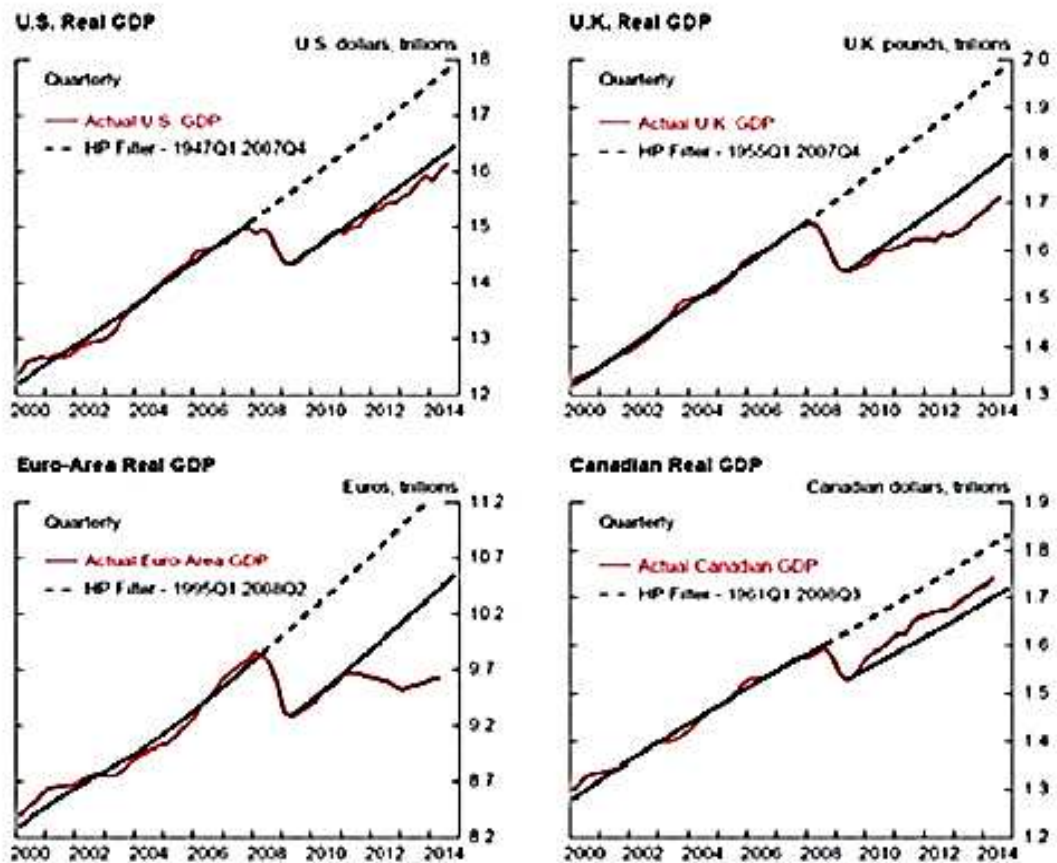
The UK's government is likely to push for banking deregulation in 2019 when leaving the EU restores political autonomy in this field to the UK. The Trump administration has already started deregulation in the US in June 2017. To the extent that the medium-term benefit is likely to be considerable in the financial community of the respective deregulation country, while the negative external side-effects of excessive deregulation is to a considerable extent borne by OECD partner countries - or countries in Asia and elsewhere –, a combined deregulation initiative of the leading global financial center countries, namely the US and the UK, will not follow the lines of optimal deregulation. Thus the system of flexible exchange rates – with partner countries of the US and the UK having no macroeconomic incentive to resist strong/excessive deregulation in the US (or the UK) - tends to generate excessive deregulation at an international level the price of which will be paid with a considerable delay by many countries. As a dominant economy in many international organizations, the US could also effectively block Basel III rules from being implemented in the US - meaning prospects for global financial stability in either the medium term or the long run are not bright.

Not all banking deregulation will have necessary effects on long-term income, wealth and inequality (with QE policies being adopted as a policy instrument of last resort after 2008 by central banks in the US, the UK and the Eurozone, it is, however, clear that the Transatlantic Banking Crisis in the end results in considerable income redistribution effects in favor of government and companies with capital market access – and if the latter are quoted on the stock market this will amount to positive wealth effects for stock owners and this certainly is not the majority of the population in any OECD country). If banking deregulation abroad would be Pareto-superior for the world economy, one would translate this into a lower risk in the growth model and long-run equilibrium output will indeed increase. The insights gained from the compact Mundell-Fleming model have to be complemented by this growth approach – and other more complex modelling in future research. A related point for future research could be to look into the dynamics of financial market deregulation within the single market program (largely believed to have enhanced competition and efficiency) and which was expected to be reinforced by the creation of the Eurozone which, however, has some apparent institutional deficits; including the on-going lack of constitutional reforms in Greece for which the Venice Commission as an expert group should have been invited to make proposals years ago.

At the bottom line, the present paper suggests a new view on the system of flexible exchange rates. Basically, flexible exchange rates stand for an institutional setup that supports adjustment in the presence of adverse shocks but, paradoxically, that system could itself enhance national and international macroeconomic instability; namely to the extent that foreign banking deregulation is indirectly encouraged by flexible exchange rates. The favorable medium-term output effect in the non-deregulating countries implies no resistance from the governments of these countries against potentially excessive – inappropriate – foreign deregulation: much in contrast to a system of fixed exchange rates. A national and international emphasis on adequate prudential supervision as well as effective cooperation among prudential supervisory authorities are required if flexible exchange rate systems are to generate positive welfare effects.

## Appendix 1: Trend Output Decline after the Banking Crisis

### Trajectories of real GDP



Source: PICHELMANN (2015), When 'Secular Stagnation' meets Piketty's capitalism in the 21st century. Growth and inequality trends in Europe reconsidered, DG ECFIN, Economic Papers 551, June 2015, Brussels, p. 5

## Appendix 2: System of Fixed Exchange Rates (endogenous are $Y, r, M$ ) – the Role of Deregulation Abroad ( $D^*$ )

$$(1) Y = c(1-\tau)Y - s'\tau'Y - c''\tau'' + b(\beta Y/K - r) + b'v + b''A + G + xY^*q^* - jY + (j''+x'')v/v^* + (x'+j')\tau'$$

$$(2) (1-\tau')M/P = hY/(h'r) = (M(1-\tau')/P)$$

$$(3) V'(r-r^*) + v'(D/D^*) + v''q^* = jY - (j''+x'')v/v^* - xY^*q^* - (x'+j')\tau'$$

$$(1') dY = cdY - cYd\tau - c\tau dY - s'Yd\tau' - s'\tau'dY + (b\beta Y)/K dY - bdr + b'dv + b''dA + dG + xY^*dq^* - jdY + (j''+x'')d(v/v^*) + (x'+j')d\tau' - c''d\tau''$$

$$(2') (1-\tau')(dM/P) - (M/P)d\tau' = (h/h'r)dY - (h/h'r^2)dr$$

Define  $h/h' = h''$

$$(2.1') (1-\tau')(dM/P) - (M/P)d\tau' = (h''/r)dY - (h''/r^2)dr$$

$$(3) V'dr - V'dr^* + v'(dD/D^*) - V'(dD^*/D^{*2}) + v''dq^* = jdY - (j''+x'')d(v/v^*) - xY^*dq^* - (x'+j')d\tau'$$

Define  $d' = D/D^*$

$$(3.1) V'dr - V'dr^* + v'(dD/D^*) - v'd'(dD^*/D^*) + v''dq^* = jdY - (j''+x'')d(v/v^*) - xY^*dq^* - s(x'+j')d\tau'$$

Rearranging gives:

$$(1'') (s + c\tau + s'\tau' - (b\beta Y)/K + j) dY + bdr = dG - cYd\tau - (s'Y + x' + j')d\tau' - c''d\tau'' + b'dv + b''dA + xY^*dq^* + (j''+x'')d(v/v^*)$$

Define  $(s + c\tau + s'\tau' - (b\beta Y)/K + j) = a'$

Define  $(-s'Y + x' + j') = \Omega$

$$(2'') (h''/r)dY - (h''/r^2)dr - (1-\tau')(dM/P) = - (M/P)d\tau'$$

$$(3'') j dY - V' dr = - (x' + j') d\tau' - (xY^* - v'') dq^* + V' dr^* - v'(dD/D^*) + v'd'(dD^*/D^*) + (j'' + x'') d(v/v^*)$$

$$\begin{pmatrix} a' & b & 0 \\ h'' & -h'' & \\ \frac{r}{j} & \frac{-h''}{r^2} & -(1-\tau') \end{pmatrix} * \begin{pmatrix} dY \\ dr \\ d(\frac{M}{P}) \end{pmatrix} = \begin{pmatrix} 1 & -cY & \Omega & -c'' & 0 & 0 & j'' + x'' & b' & b'' & xY^* & 0 \\ 0 & -(\frac{M}{P}) & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -(x' + j') & 0 & -v' & v'd' & j'' + x'' & 0 & 0 & -(xY^* - v'') & -V' \end{pmatrix} * \begin{pmatrix} dG \\ d\tau \\ d\tau' \\ d\tau'' \\ \frac{D}{D^*} \\ \frac{dD^*}{D^*} \\ \frac{D^*}{D^*} \\ d(\frac{v}{v^*}) \\ \frac{dv}{v^*} \\ dA \\ dq^* \\ dr^* \end{pmatrix}$$

Using Cramer's rule we get:

$$DET A = -bj(1-\tau') - (V'a'(1-\tau'')) < 0$$

$$dY/((dD)/D^*) = (bv'(1-\tau'')) / DET A$$

$$dY/dG = (V'(1-\tau'')) / DET A < 0$$

$$dY/d\tau = (V'a(1-\tau'')) / DET A < 0$$

$$dY/d\tau' = (b(1-\tau')(x' + j') - V'a(1-\tau'')) / DET A > 0 \text{ if } V'a(1-\tau'') > b(1-\tau')(x' + j')$$

$$dr/((dD^*)/D^*) = -a'v'd'(1-\tau') / DET A > 0$$

$$dr/dG = (-b(1-\tau'')) / DET A > 0$$

$$dr/d\tau = (cYj(1-\tau') - (V'a'(1-\tau'')) / DET A < 0 \text{ if } cYj > V'a'$$

$$dr/d\tau' = (-\Omega(1-\tau'')j + a'(x' + j')(1-\tau'')) / DET A < 0 \text{ if } a'(x' + j') > \Omega$$

$$d(M/P)/((dD)/D^*) = [(-a'v'(h''/r^2) + v'b(h''/r)] / DET A > 0 \text{ if } a/r > b$$





### Appendix 3: Flexible Exchange Rates

$$\begin{pmatrix} a' & b & -xY^* \\ h'' & -h'' & 0 \\ r & \frac{b}{r^2} & -v'' \\ j & -v'' & xY^* \end{pmatrix} * \begin{pmatrix} dY \\ dr \\ dq^* \end{pmatrix} = \begin{pmatrix} 1 & -cY & \Omega & -c'' & 0 & 0 & j'' + x'' & b' & b'' & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 - \tau' & 0 \\ 0 & 0 & x' + j' & 0 & -v' & v'd' & j'' + x'' & 0 & 0 & 0 & -v' \end{pmatrix} * \begin{pmatrix} dG \\ d\tau \\ d\tau' \\ dD \\ \frac{D^*}{D^*} \\ \frac{dD^*}{D^*} \\ d\left(\frac{v}{v^*}\right) \\ \frac{dv}{v^*} \\ dA \\ \frac{M}{P} \\ \frac{d(M/P)}{dr^*} \end{pmatrix}$$

Using Cramer's rule we obtain:

$$\text{DET A} = (a' \frac{h''}{r^2} (xY^* - v'') + xY^* \frac{h''}{r^2} V') - (j \frac{h''}{r^2} xY^* + (xY^* - v'') \frac{h''}{r} b) < 0 \text{ (assumption)}$$

$$dY / ((dD) / D^*) = (v' \frac{h''}{r^2} xY^*) / \text{DET A} < 0$$

$$dY / ((dD^*) / D^*) = (-v' d' \frac{h''}{r^2} xY^*) / \text{DET A} > 0$$

$$dY / dG = (\frac{-h''}{r^2} xY^* - v'') / \text{DET A} > 0$$

$$dY / d(M/P) = [(xY^* V' (1 - \tau') - (xY^* - v'') (1 - \tau') b)] / \text{DET A} \geq 0$$

$$dY / d\tau = (cY \frac{h''}{r^2} (xY^* - v'')) / \text{DET A}$$

$$dY / d\tau' = [(\Omega \frac{-h''}{r^2} (xY^* - v'')) - (xY^* (\frac{M}{P}) V') - (x' + j') \frac{h''}{r^2} xY^* - j b (\frac{M}{P})] / \text{DET A}$$

It is possible that the rise of the VAT rate raises equilibrium output – with the crucial impact of the VAT rate on the current account – so that a quasi-non-Keynesian output effect could be observed: a restrictive fiscal policy (here the increase of the VAT rate) leads to a real output increase and a lower budget deficit while improving the current account. A rise of real GDP can occur if the VAT rate impact on the net exports exceeds the dampening effect on consumption. Certain policy episodes in the 1990s in Scandinavian countries – with rather high VAT rates (and a fairly strong tax morale that helps to avoid that a higher VAT rate translates into a strong expansion of the shadow economy) might reflect this pattern of effects. The positive output effect could be reinforced if one considers a long-run growth model in which a rise of the VAT rate raises

the effective savings ratio; a positive link between a rise of the VAT rate and the long-run output effect in the growth model (read: an increase of the level of the growth path: see appendix 4) could indeed reinforce medium-term output expansion to the extent that the improved long-run output situation translates into a lower expected future income tax rate. The EU countries can use the VAT rate as an additional national policy instrument which might be an advantage for Europe vis-à-vis the US.

$$\begin{pmatrix} a' & b & -xY^* \\ \frac{h''}{r} & -\frac{h''}{r^2} & 0 \\ j & -V' & xY^* - v'' \end{pmatrix} * \begin{pmatrix} dY \\ dr \\ dq^* \end{pmatrix} = \begin{pmatrix} 1 & -cY & \Omega & -c'' & 0 & 0 & j'' + x'' & b' & b'' & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 - \tau' & 0 \\ 0 & 0 & x' + j' & 0 & -v' & v'd' & j'' + x'' & 0 & 0 & 0 & -V' \end{pmatrix} * \begin{pmatrix} \frac{dG}{d\tau} \\ \frac{d\tau'}{dD} \\ \frac{dD}{D^*} \\ \frac{dD^*}{D^*} \\ d\left(\frac{v}{v^*}\right) \\ \frac{dv}{dA} \\ \frac{dA}{d\left(\frac{M}{P}\right)} \\ \frac{dr^*}{dr} \end{pmatrix}$$

$$dr/((dD)/D^*) = (xY^* \frac{h''}{r} v') / \text{DET A}$$

$$dr/((dD^*)/D^*) = (-xY^* \frac{h''}{r} v'd') / \text{DET A} > 0$$

$$dr/d(M/P) = [(a'(1-\tau')xY^* - v'') - j(h''/r^2)xY^*] / \text{DET A}$$

$$dr/dG = (xY^* - v'') \frac{h''}{r} / \text{DET A} > 0$$

$$dr/d\tau = ((xY^* - v'') \frac{h''}{r} (-cY)) / \text{DET A}$$

$$dr/d\tau' = ((-xY^* \frac{h''}{r} x' + j') - (xY^* - v'') \frac{h''}{r} \Omega) / \text{DET A}$$

$$dq^*/((dD)/D^*) = \left[ (v'a' \frac{h''}{r^2}) - (v' \frac{h''}{r} b) \right] / \text{DET A}$$

$$dq^*/((dD^*)/D^*) = \left[ (-v'd'a' \frac{h''}{r^2}) + v'd'b \frac{h''}{r} \right]$$

$$dq^*/d(M/P) = [bj(1 - \tau') + V'(1 - \tau')a'] / \text{DET A}$$

$$dq^*/dG = [-V' \frac{h''}{r} + j \frac{-h''}{r^2}] / \text{DET A}$$

$$dq^*/d\tau = [(cYV' \frac{h''}{r}) - (j \frac{-h''}{r^2} cY)] / \text{DET A}$$

$$dq^*/d\tau' = [(a' \frac{-h''}{r^2} (x' + j') + \Omega \frac{h''}{r} V') - (j \frac{h''}{r^2} \Omega + (j'' + x'') \frac{h''}{r} b)] / \text{DET A}$$

The current account position  $X'$  may be defined as  $xY^*q^* - jY = X'$ . We can calculate  $dX'/d\tau' = xY^* dq^*/d\tau' - j dY/d\tau'$

## **Appendix 4: Basic Reflections on the Long-Run Impact of Risk and Foreign Deregulation, Respectively, in a Growth Model with Trade and FDI**

The following ingredients of the enhanced Solow growth model consist of a new production function, a new savings function and a combined emphasis on trade and cumulated foreign direct investment where the latter also requires to make a distinction between gross domestic product and gross national income – namely, with a focus on international dividend payments related to cumulated FDI. The Solow model is quite useful in an enhanced version (it is compatible with “modern growth theory” if one assumes an intertemporal elasticity of substitution in the consumption function of unity and a time preference of zero; and the Ramsey growth analysis shows that the savings function in the steady state is characterized by a constant savings ratio). The production function will consider private capital  $K$ , public capital  $K'$ , labor  $L$ , knowledge  $A$ , real balances  $M/P$  as input factors as well as the impact of trade intensity (actually the role of the export-GDP ratio and the import-GDP ratio) plus the role of risk; the latter is related to the excessive deregulation of banks and financial markets, respectively. In a nutshell, the growth model’s solution – based on the equilibrium condition for the goods market – offers insights on the role of monetary and tax policy as well as fiscal policy (defined as change of infrastructure investment relative to GDP) plus the role of deregulation: excessive foreign deregulation is assumed to raise risk ( $\sigma$ ) which will raise the marginal production costs of firms and thereby lead to a lower aggregate output ( $Y$ ). At first we will have to consider the savings function in order to include the role of the VAT rate that usually is neglected in growth models although the VAT rate plays an important role in all EU countries since the late 1960s and in China since 1979.

The savings function has to be derived from the consumption function and the definition of the uses side of income  $Y = C + S + T$  ( $C$  is consumption,  $S$  is savings,  $T$  is tariff revenue). The consumption function is  $C$  in a system with income taxation (tax rate is  $\tau$ ) and value-added taxation (VAT rate  $\tau'$ ) which falls on consumption, so that one can write (with  $0 < c < 1$ ; and  $c' > 0$ ):

$$(I) \quad C = c(1 - \tau)Y - c'\tau'Y$$

In the absence of cumulated foreign direct investment one can write  $S = Y - C - T$  so that one can state the corresponding savings function  $S$  after the tax revenue has been considered:

$$(II) \quad T = \tau Y + \tau' [c(1 - \tau)Y - c'\tau'Y]$$

$$(III) S = Y - [c(1-\tau)Y - c'\tau'Y] - \tau Y - \tau' [c(1-\tau)Y - c'\tau'Y]$$

Defining  $s := 1-c$  we get from  $S = (1-\tau)(1-c(1+\tau')) + c'\tau'(1+\tau') - (1-\tau)$  the expression:

$$(IV) S = [s(1-\tau) + c'\tau'(\tau' + \tau)]Y = [s - \tau(s - c'\tau') + c\tau'^2]Y$$

A convenient approximation – assuming that  $c\tau'^2$  is close to zero (valid only if the VAT rate is rather low) – is  $S = (s(1-\tau) + c'\tau'\tau)Y$ , which shows that the VAT rate raises overall savings. This is quite important since a simple neoclassical growth model (with  $K$ ,  $A$  and  $L$  denoting the capital stock, knowledge and labor, respectively) with a production function  $Y=K^\beta(AL)^{1-\beta}$  and an exogenous growth rate of the population ( $n$ ) and of knowledge ( $a$ ) implies from the equilibrium condition for the goods market, namely savings  $S= dK/dt + \delta K$ , the following steady state solution (denoted by #,  $t$  is the time index,  $\delta$  the depreciation rate) for a closed economy without government expenditures ( $k' := K/(AL)$ ):

$$(V) k' \# = \left[ \frac{s(1-\tau) + c'\tau'\tau}{(a+n+\delta)} \right]^{1/(1-\beta)}$$

Defining  $y' := \frac{Y}{AL}$  we can write:

$$(VI) y' \# = \left[ \frac{s(1-\tau) + c'\tau'\tau}{(a+n+\delta)} \right]^{\beta/(1-\beta)}$$

The steady state growth rate of output is equal to the growth rate of knowledge ( $a$ ) plus the growth rate of the population ( $n$ ). A new element in this equation – compared to the Solow growth model – is the role of the VAT rate that raises the effective savings rate and therefore raises the equilibrium capital intensity. Subsequently, as new elements in the model are added:

- the VAT rate (see above);
- the role of real money balances in the production function
- the role of infrastructure capital and the deficit-GDP ratio (fiscal policy element)
- the role of cumulated foreign direct investment inflows
- the role of trade
- the role of uncertainty – this is analytically linked to excessive banking deregulation, but the trade intensity also could be affected.

Thus one gets a battery of long-run output multipliers which could be compared to medium-term multiplier analysis.

The long run setting to be considered here is one with zero capital depreciation for infrastructure capital and cumulated FDI inflows where  $\alpha^*$  is the share of private capital (K) owned by foreign investors. This is reflecting the term  $v^*q^*$  in the balance of payments equilibrium condition of the medium-term Keynesian system (and a function  $\alpha^*(q^*)$  might also be considered, but here one may refrain from this). The uses side of national income (GNP) now has to be written as follows (with asymmetrical FDI):

$$(VII) \quad Y(1 - \alpha^* \beta) = C + S + T$$

The share of profits in GDP is  $\beta$  if one assumes competition in goods and factor markets plus profit maximization. The long-run savings function now has an additional term that effectively reflects reinvestment by multinational subsidiaries ( $s'' > 0$ ); profits of foreign subsidiaries are supposed to be untaxed. The savings function thus is given by

$$(VIII) \quad S = (s(1 - \tau) + c'\tau\tau)(1 - \alpha^* \beta)Y + s''\alpha^* \beta Y = [s(1 - \tau) + c'\tau\tau + \alpha^* \beta(s'' - s(1 - \tau) - c'\tau\tau)]Y = s_0 Y$$

Savings in an economy with inward foreign direct investment (FDI) exceeds that of an economy with no such FDI if  $s'' > s(1 - \tau) + c'\tau\tau$ . It should be noted that from a theoretical – and empirical – perspective, the term  $\alpha^*$  can also influence the progress rate (the growth rate of knowledge), namely if one would assume  $a = a' + a''\alpha^*$  where  $a'$  is the exogenous growth rate of knowledge and  $a''\alpha^*$  (with  $a'' > 0$ ) is the term that indicates the impact of the stock of inward FDI on the growth rate of knowledge. In such a setting, foreign multinationals have an impact on both the level of the growth path and the growth rate of output in the steady state; even if the impact of multinationals on the savings rate were negative, their positive effect on the knowledge growth rate could imply a positive output effect that should be relevant for the decision-making of politicians provided that their time horizon is sufficiently long.

The goods market equilibrium condition  $S = dK/dt + \delta K + dK'/dt$  (savings equals private gross investment plus infrastructure investment; the latter is financed from a deficit that is proportionate (parameter  $\delta'$ ) to output) and  $S/(AL) = (dK/dt)/(AL) + \delta K/(AL) + \delta' Y/(AL)$ , respectively, will lead in combination with the production function to the steady state solution for  $K/(AL) := k'$  (# denotes the steady state;  $y' := Y/(AL)$ ). One has to consider the goods market condition for the case of a balanced current account, namely  $s_0 y' = (dK/dt)/(AL) + \delta k' + \delta' y'$  and so we get with  $m' := (M/P)/(AL)$  the equation ( $\beta \# := \beta + \beta' + \beta''$ ; recall the production function:  $Y = (1 + \varphi'x)(1 + \varphi''j)(1 - \sigma'\sigma)(M/P)^{\beta'} K^{\beta''} K^{\beta} (AL)^{1-\beta}$ ):

$$(IX) \quad \frac{dk'}{dt} = [s(1 - \tau) + c'\tau\tau + \alpha^* \beta(s'' - s(1 - \tau) - c'\tau\tau)]y' - \delta' y' - (a + n + \delta)k'$$

One should note that according to DOMAR (1944) we have – with B/P for real government debt - for the ratio of government debt to gross domestic product (B/P)/Y=  $\delta'/(a+n)$ ; since all deficits of government are assumed to finance public investment we can write (B/P)/Y= (K'/(AL))/y' =  $\delta'/(a+n)$  and therefore K'/(AL) =  $(\delta'y' \#)/(a+n)$  so that we have with  $y'=(1+\varphi'x)(1+\varphi''j)(1-\sigma'\sigma)m^{\beta'}$  (K'/(AL))<sup>B'</sup> k'<sup>B</sup>:

$$(IX') \quad k' \# = \left[ \frac{(1+\varphi'x)(1+\varphi''j)(1-\sigma'\sigma)m^{\beta'} \left( \frac{\delta'y'}{a+n} \right)^{\beta''}}{s(1-\tau) + c'\tau\tau' + \alpha * \beta((s'' - s(1-\tau) - c'\tau'\tau)) - \delta'} \right]^{1/(1-\beta)}$$

Using the definition  $s:= 1-c$  and taking into account (K'/(AL))<sup>#</sup>=  $\delta'y'/(a+n)$  we can write for y' # (using IX'):

$$(IX'') \quad y' \# = (1+\varphi'x)(1+\varphi''j)(1-\sigma'\sigma)m^{\beta'} \left( \frac{\delta'y'}{a+n} \right)^{\beta''} \cdot \left[ \frac{(1+\varphi'x)(1+\varphi''j)(1-\sigma'\sigma)m^{\beta'} \left( \frac{\delta'y'}{a+n} \right)^{\beta''} s(1-\tau) + c'\tau\tau' + \alpha * \beta((s'' - s(1-\tau) - c'\tau'\tau)) - \delta'}{a+n+\delta} \right]^{\beta/(1-\beta)}$$

$$(X) \quad y' \# = [(1+\varphi'x)(1+\varphi''j)(1-\sigma'\sigma)]^{1/(1-\beta)} m^{\beta'/(1-\beta)} \left( \frac{\delta'y'}{a+n} \right)^{\beta''/(1-\beta)} \cdot \left\{ (1-c)(1-\tau) + c'\tau\tau' + \frac{\alpha * \beta((s'' - s(1-\tau) - c'\tau'\tau)) - \delta'}{(a+n+\delta)} \right\}^{\beta/1-\beta}$$

$$(X') \quad y' \#^{(1-\beta-\beta'')/(1-\beta)} = [(1+\varphi'x)(1+\varphi''j)(1-\sigma'\sigma)]^{1/(1-\beta)} m^{\beta'/(1-\beta)} \left( \frac{\delta'}{a+n} \right)^{\beta''/(1-\beta)} \cdot \left\{ (1-c)(1-\tau) + c'\tau\tau' + \frac{\alpha * \beta((s'' - s(1-\tau) - c'\tau'\tau)) - \delta'}{(a+n+\delta)} \right\}^{\beta/(1-\beta)}$$

Hence we see that infrastructure capital effectively raises the output elasticity of the stock of real money balances and other factors, as we can write:

$$(XI) \quad y' \# = \left[ (1 + \varphi' x)(1 + \varphi'' j)(1 - \sigma' \sigma) \right]^{1/(1-\beta-\beta'')} m'^{\beta''/(1-\beta-\beta'')} \left( \frac{\delta'}{a+n} \right)^{\beta''/(1-\beta-\beta'')} \\ \cdot \left\{ (1-c)(1-\tau) + c' \tau \tau' + \frac{\alpha^* \beta'' (s'' - s(1-\tau) - c' \tau' \tau) - \delta'}{a+n+\delta} \right\}^{\beta''/(1-\beta-\beta'')}$$

Assuming  $\varphi' x$ ,  $\varphi'' j$  and  $\sigma' \sigma$  as well as  $-c(1-\tau) + c\tau + c' \tau \tau' + \alpha^* \beta'' (s'' - s(1-\tau) - c' \tau' \tau) - \delta'$  to each be close to zero, we can take logs and obtain as an approximation:

$$(XII) \quad \ln y' \# \approx \left( \frac{1}{(1-\beta-\beta'')} \right) (\varphi' x + \varphi'' j - \sigma' \sigma) + \frac{\beta'' \ln m'}{(1-\beta-\beta'')} \\ + \frac{\beta''}{(1-\beta-\beta'') \ln \left( \frac{\delta'}{a+n} \right)} + \frac{\beta''}{(1-\beta-\beta'')} \\ \cdot \left[ -c - \tau + c\tau + c' \tau \tau' + \alpha^* \beta'' ((s'' - s(1-\tau) - c' \tau' \tau) - \delta') - \ln(a+n+\delta) \right]$$

It is assumed that  $(\beta+\beta'') < 1$  which is quite plausible. The level of the growth path of  $\ln y'$  is a positive function of  $x$ ,  $j$ ,  $m'$ ,  $s''$  and the VAT rate as well as a negative function of risk; a rise of  $(a+n)$  has a negative effect on the level of the growth path, but a positive effect on the growth rate of  $Y$  in the steady state. It is not difficult to see that the infrastructure capital stock (relative to AL) has an ambiguous impact (see  $\delta'$ ) with respect to  $y'$  so that we have a new explanation as to why empirical studies often find an ambiguous impact on long-run output per capita (or  $y' \#$ ; one may note that the analytical solution is more compact if the rate of capital depreciation for  $K$  is assumed to be zero). The impact of  $\alpha^*$  on the level of the long-run growth path is also ambiguous; if it is negative, while one would consider a positive impact of  $\alpha^*$  on the progress rate, there could be an interesting trade-off which, however, also requires to take into account the length of the time horizon of politicians.

The steady state per capita income is a negative function of  $\sigma$  for which foreign deregulation (and domestic financial deregulation) is relevant. As regards a major international banking crisis, one may assume that this will dampen trade – hence  $x$  and  $j$  will decline – and government funding of bank rescuing operations will reduce the public capital stock-GDP ratio and hence  $\delta'$ ; a banking crisis will cause higher deficits devoted to bank rescuing operations and hence the public debt financing deficit-GDP ratio (for infrastructure investment) will fall. One should notice that the solution derived for the long-run equilibrium shows a broad range of policy instruments that could be used for achieving maximum per capita income in the steady state, including the income tax rate and the VAT rate. It is also clear that a higher share of foreign ownership ( $\alpha^*$ ) in the private capital stock could reduce the level of the growth path of output if the share of foreign subsidiaries' profits invested is fairly low. However, if  $\alpha^*$  raises the growth rate of knowledge, a sufficiently long time horizon of politicians will support opening up for foreign direct investment inflows. A positive link between  $\alpha^*$  and the quality of employment may be expected to the extent that the subsidiaries of foreign multinationals



will typically invest in the training/retraining of workers. To the extent that foreign investors also stimulate the exports of goods and services, the function for the exports of goods should read  $X = xY^*q^* + x'\tau' + x''\alpha^*$  ( $x'' > 0$ ; governments in some countries impose minimum export intensities on foreign investors in the manufacturing industry). To what extent a stronger presence of multinational companies' subsidiaries (in the manufacturing industry) raise or dampen the pressure for flexible exchange rates in the host country – assuming a fixed exchange rate to be given in the initial situation – is unclear. If there were two-way foreign direct investment, the real GNP would have to be written as  $Z = Y(1 - \alpha^*\beta) + \alpha\beta^*Y^*q^*$ , where  $\alpha$  is the share of the capital stock in country 2 owned by investors from country 1 (the output elasticity of the capital stock abroad, namely  $K^*$ , is assumed to be  $\beta^*$  and further assuming competition in goods markets and factor markets as well as profit maximization  $\beta^*$  will be the share of profits in  $Y^*$ ). Recall that consumption in an economy with cumulated foreign direct investment country 1 is given by  $C = c(1 - \tau)Z - c'\tau'Z$ ; one may also want to re-specify the import function as  $J = jZ/q^* + \dots$  and exports as  $X = xZ^*q^*$  (here again with the simplification of an import elasticity with respect to  $q^*$  of minus 1 and an export elasticity with respect to  $q^*$  of 1).

As regards the golden rule, the maximization of per capita consumption in the steady state requires that  $\beta(1 + \varphi'x)(1 + \varphi''j)(1 + \sigma'\sigma)m^{\beta'}(K'/(AL))^{\beta''}k^{\beta-1} = (a + n + \delta)$ . Again, if all deficits of government – the government deficit-GDP ratio is  $\delta'$  – were used to invest in public capital  $K'$  – so that  $K'/Y = \delta'/(a + n)$  and therefore  $K'/(AL)/y' = \delta'/(a + n)$ ; thus  $K'/(AL) = \delta'y'/(a + n)$ . Therefore

$$(XIII) \quad \beta(1 + \varphi'x)(1 + \varphi''j)(1 + \sigma'\sigma)m^{\beta'} \left( \frac{\delta'}{a + n} \right)^{\beta''} k^{\beta-1} y'^{\beta''} = (a + n + \delta)$$

We can replace  $y'$  and get in the steady state the condition for the golden rule:

$$(XIV) \quad (a + n + \delta) = \beta(1 + \varphi'x)(1 + \varphi''j)(1 + \sigma'\sigma)m^{\beta'} \left( \frac{\delta'}{a + n} \right)^{\beta''} k^{(\beta-1)\beta''}$$

$$\cdot \left[ (1 + \varphi'x)(1 + \varphi''j)(1 - \sigma'\sigma) \right]^{\beta''/(1-\beta-\beta'')} m^{\beta'\beta''/(1-\beta-\beta'')} \left( \frac{\delta'}{a + n} \right)^{\beta''\beta''/(1-\beta-\beta'')}$$

$$\cdot \left\{ (1 - c)(1 - \tau) + c'\tau\tau' + \frac{\alpha^*\beta((s'' - s(1 - \tau) - c'\tau'\tau) - \delta')}{a + n + \delta} \right\}^{\beta\beta''/(1-\beta-\beta'')}$$

This equation can be solved for  $k^{\text{gold}}$ . One may consider additionally money market equilibrium in the form  $M/P = hy/(h'r)$ ; thus  $m' = hy'/(h'r)$  where  $r$  is the real interest rate ( $h > 0$ ,  $h' > 0$ ). The rather simple enhanced growth model includes many policy instruments: monetary policy, fiscal policy (two tax rates and the public infrastructure financing deficit-GDP ratio) as well as foreign trade and foreign investment policy parameters that could be relevant in the context of economic globalization. To the extent that one would consider a function  $\alpha(q^*)$ , one could also consider a straightforward link between (cumulated) FDI and the real exchange rate. One might consider (with parameters  $x > 0$ ,  $j > 0$ ,  $z'' > 0$ ,  $z > 0$ ;

$q^* := eP^*/P$ ,  $e$  is the nominal exchange rate) the condition for equilibrium in the foreign exchange market in the form

$$(XV) \left( \frac{r^*}{r} \right)^{z''} q^{*-z} = \frac{x(Y^* q^* + \alpha^* \beta Y)(1 + x' \tau')}{jY(1 - \alpha^* \beta)(1 - j' \tau')}$$

where the LHS stands for the ratio of capital exports to capital imports – including both portfolio capital flows and FDI – while the RHS is the ratio of exports of goods and services to imports of goods and services. Here the net FDI outflow function is written as  $q^{*-z}$  (reflecting the FROOT/STEIN argument), portfolio capital outflows are  $(r^*/r)^{z''}$  and the assumption is that FDI net outflows and portfolio capital outflows are positively linked. The VAT rate  $\tau'$  is assumed to have a positive effect on exports and a negative effect on imports ( $x' > 0$ ,  $j' > 0$ ) and exports are assumed to be proportionate to foreign GNP while imports are proportionate to domestic GNP (not to GDP as in the standard literature); for the sake of simplicity the elasticity of imports with respect to the real exchange rate is assumed to be minus unity and the elasticity of exports with respect to  $q^*$  is unity. Dividing by  $Y^* q^*$  gives

$$(XVI) \left( \frac{r^*}{r} \right)^{z''} q^{*-z} = \frac{x \left( 1 + \alpha^* \beta \left( \frac{Y}{Y^* q^*} \right) \right) (1 + x' \tau')}{\left( \frac{jY}{Y^* q^*} \right) (1 - \alpha^* \beta) (1 - j' \tau')}$$

Taking logs (while assuming  $\alpha^* \beta$ ,  $x' \tau'$  and  $j' \tau'$  each being close to zero and that  $Y/(Y^* q^*)$  is close to zero which is in line with the case of a small open economy considered) gives:

$$(XVII) z'' \ln \left( \frac{r^*}{r} \right) - z \ln q^* \approx \ln x + \alpha^* \beta \left( \frac{Y}{Y^* q^*} \right) + (x' + j') \tau' + \alpha^* \beta - \ln j - \ln \left( \frac{Y}{Y^* q^*} \right)$$

Thus we have a three equation growth model, namely the equilibrium condition for the goods market (savings equals gross investment, including public investment). The money market equilibrium is  $m'(1 - \tau')/P = hy'/(h'r)$  and the above equilibrium condition for foreign exchange market equilibrium is also straightforward. Note that  $Y/Y^*$  can be expressed as  $(y'/y'^*)(AL)/(A^*/L^*)$  so that a system of three linear equations can be stated if one assumes that  $a+n = a^*+n^*$  which makes the ratio  $(AL)/(A^*L^*) = \lambda$  stationary.

$$(XVIII) z'' \ln \left( \frac{r^*}{r} \right) - z \ln q^* \approx \ln x + (\alpha^* \beta) \left( \frac{\lambda y'}{y^* q^*} \right) + (x' + j') \tau' + \alpha^* \beta - \ln j - \ln \left( \frac{\lambda y'}{y^* q^*} \right)$$

The three equations determine  $y'$ ,  $r$  and  $q^*$  in a long-run full employment approach. There is a rich menu of policy parameters, including monetary policy (but not an inflationary policy, since otherwise one would have to replace  $r$  in the money market equation by the nominal interest rate  $i$  and would also have to reconsider the production function – with

depreciations on real money balances – and the goods market equilibrium; possibly with a term that reflects the impact of the inflation rate on the savings rate). Differentiating the relevant equations for the goods market, the money market and the foreign exchange market, long-run multipliers can be derived. Furthermore, the golden rule issue – maximizing per capita consumption – is interesting; under certain circumstances it will consist of both a maximization of the level of the per capita consumption growth path and a maximization of the growth rate of knowledge; the latter is relevant if there is a Kaldor-type progress function to be considered as suggested above (endogenous growth). There is also the interesting problem that a rise of the progress rate reduces the level of the growth path while it raises the growth rate of output in the steady state. The setup developed here should be quite useful to better understand globalization issues and also for comparisons of medium-term multiplier results with long-run multiplier effects.

At the bottom line it has been shown that a rich growth model can be developed in a rather compact way and that all policy instruments that are available in the medium term can also be considered in a more long-term full employment approach. An additional element that one may want to consider is the impact of foreign knowledge  $A^*$  on output  $Y$  and the production function of country 1, respectively. One option would be to consider an additional term  $(1+n''A^*/(KL))$  – with  $n''>0$  – that indicates international technology spillover effects; if, by coincidence, the growth rate  $a^* = 2a + 2n$ , the term  $A^*/(KL)$  would be stationary;  $A^*$  could, of course, also affect the dynamics of  $A(t)$ ; moreover, one could consider a system where a share  $\delta''$  of output is devoted to research and development activities and  $a = a' + a''a^* + \lambda''\delta''$  ( $\lambda''>0$ ); R&D output would be considered as intermediate inputs and to the extent that it represents product innovations, one would also have to write  $P = P_0(1+\tau'')(1+V\delta'')$ . Effective GDP would have to be defined as  $Y(1+V\delta'')$  which is a hedonic price-related view on output where  $V$  is a positive parameter reflecting the degree of quality improvement. The new equilibrium solutions derived could be implemented in empirical analysis in a rather straightforward manner.

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