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New Marshall-Lerner Conditions for an Economy with Outward and Two-Way Foreign Direct Investment

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Summary

The international debate about trade imbalances often puts the focus on the role of domestic GDP/foreign GDP and the role of real exchange rate changes – with respect to the latter adjustment channel, the standard question is whether or not the Marshall-Lerner condition is fulfilled. While recent trade literature has focused on exchange rate pass-through the role of FDI has not been much discussed. With outward foreign direct investment (FDI) and inward FDI becoming increasingly important, the question about the real exchange rate impact on the trade balance has to be restated as imports are proportionate to real gross national income and this indeed implies a new Marshall-Lerner condition. It is shown that with outward cumulated FDI, the modified condition is stricter than the traditional case and with both outward FDI and inward FDI, the elasticity requirement is ambiguous. "FDI globalization" might go along with unpleasant trade imbalance problems so that additional empirical research is needed as well as stronger international policy cooperation as high trade balance deficits/high trade balance surplus positions could be rather difficult to correct through exchange rate adjustments only. Looking at the import elasticities for all partner countries of the US – or country x – together is quite misleading for policymakers.

Zusammenfassung

Die internationale Debatte zu Handelsbilanzungleichgewichten fokussiert häufig auf die Rolle von inländischem oder ausländischem Bruttoinlandsprodukt und die Rolle realer Wechselkursänderungen – dabei ist mit Blick auf letzteren Anpassungskanal ein gewichtige Standardfrage, ob die Marshall-Lerner Bedingung erfüllt ist. Mit der zunehmenden Bedeutung von Direktinvestitionsabflüssen und Direktinvestitionszuflüssen muss die Frage nach der Rolle des realen Wechselkurses mit Blick auf die Handelsbilanzreaktion neu gestellt werden, da die Güterimporte proportional zum realen Brutto-Nationaleinkommen sind; das bedeutet eine neue, veränderte Marshall-Lerner Bedingung. Gezeigt wird, dass bei kumulierten Auslandsdirektinvestitionen die modifizierte Bedingung strikter als die traditionelle Bedingung ist: Die Direktinvestitionsintensität, die ausländische Gewinnquote und die Größe des Landes relative zum Welteinkommen spielen nun zusätzlich eine wichtige Rolle. Hat man sowohl Zuflüsse wie Abflüsse bei Direktinvestitionen wird die Bedingung uneindeutig. "Direktinvestitions-Globalisierung" könnte von daher mit unerfreulichen Handelsbilanz-Ungleichgewichtsproblemen einhergehen, wobei zusätzliche empirische Forschung notwendig ist; ebenso zudem verstärkte international Politikkooperation, da hohe Defizit- oder Überschusspositionen kaum allein durch reale Wechselkursänderung zu korrigieren sind. Protektionismus-Politik, die zu Direktinvestitionen als Mittel zum Überspringen von Zollmauern führt, unterminiert die Handelsbilanzanpassung via reale Wechselkurse. Wenn man die Importelastizitäten für alle Handelspartner zusammen betrachtet, ist das irreführend für die Politik.

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1. Introduction

The reaction of the trade balance with respect to a rise of the real exchange rate has traditionally been an important aspect in International Macroeconomics, particularly when the question relates to how to correct a relatively large trade balance deficit. This topic has become quite important as an economic policy aspect since Donald Trump's election as President of the United States in January 2017. The international debate over the trade balance deficit of the US has many aspects and part of the discussion actually seems not to be in line with standard macroeconomic analysis. The Council of Economic Advisers has summarized some key views of the Trump Administration in its 2018 report (COUNCIL OF ECONOMIC ADVISERS, 2018). An important point that has thus far been overlooked in the discussion altogether is the role of (cumulated) foreign direct investment (FDI) and the associated necessary distinction between gross domestic product (GDP) and gross national product (GNP). For the analytically rather transparent case of asymmetric outward FDI, a new Marshall-Lerner condition can be derived; and it has some obvious policy relevance for a major FDI source country such as the US. The more complex case of both inward and outward cumulated FDI can also be analyzed with respect to the trade balance and a modified Marshall-Lerner condition. It can be shown that the case of both outward FDI and inward FDI could make the requirement on the sum of import elasticities stricter or the standard requirement is, depending in parameter values, attenuated: The sum of the absolute import elasticities with respect to the exchange rate must exceed more than unity in the case of outward FDI and if one adds inward FDI, the requirement could become stricter. It cannot be ruled out that trade imbalances in the new world of twin globalization – namely both trade globalization and FDI globalization – is much more difficult to correct through the real exchange rate mechanism so that more adjustment pressure would have to fall on differential output growth at home and abroad, respectively. With more and more countries from the OECD group, as well as many Newly Industrialized Countries and China becoming active as both FDI host and as source countries, the subsequent considerations seem to be quite important.

Why is the size of import elasticities (in absolute terms) so important? When faced with an unsustainable trade balance deficit, government policymakers indeed look at these figures; and if the IMF considers the external position of a country as unsustainable, these elasticities are crucial and thus included in Article IV Reports and other surveillance activities – often with a focus on the current account and on trade balance figures. Indeed as the IMF (2006, p.3) has noted with respect to medium income countries: *"Estimates of the impact of exchange rate movements on the trade balance are central to the Fund's surveillance and program design work."* One may emphasize the following point made by the authors: As regards trade balance adjustment, it seems that in middle-income countries an improvement can typically be achieved through the import side which seems to have a higher responsiveness than the goods export side of many countries; industrialized countries are often characterized by the pricing to market behavior of firms so that nominal exchange rate changes are not fully passed on to customers abroad. The authors also write (IMF, 2006, p.4): *"While there is an extensive academic literature on estimating "trade equations"..., most studies focus on specific goods, or on imports, or on exports (but not both), making it*

difficult to infer the impact on the aggregate trade balance. Yet, from a macroeconomic perspective, it is this aggregate effect that is of importance."

While recent trade literature has focused on exchange rate pass-through (e.g. BUSSIÈRE ET AL., 2016), the role of FDI has not been much discussed. One might also want to consider channels that link FDI to the debate on exchange rate pass-through related to global value chains and indeed there is a considerable degree of complementarity between involvement in global value chains and FDI (AMENDOLAGINE ET AL., 2017) – this has a direct impact on the effect of exchange rate changes on trade since the cost of production – here: intermediate products – will partly depend on such exchange rate changes. The original Marshall-Lerner condition assumes full pass-through and to avoid making the analysis to complex this original Marshall-Lerner condition will be analyzed here with a focus on FDI. It is clear that the pass-through effects will make the picture more complex. The framework chosen is relatively straightforward, but will in the first part not consider capital depreciation; only in the second part of the analysis is this done and moreover the phenomenon of risk premiums for foreign investment – often emphasized in the case of US FDI – is highlighted. While the conclusions drawn in the basic analytical framework are weakened by considering the capital depreciation rate, the inclusion of a risk-premium reinforces the initial conclusions so that a more realistic setting with capital depreciation and the risk-premium does not change the overall conclusions derived in the first analytical steps. As regards the relevance of the paper for current account balance analysis, one should exercise some caution since the importance of trade in the current account has declined over time and indeed the share of factor payments – partly reflecting FDI and international portfolio investment – has increased (see, e.g. SCHMIDT (2018)).

The following analysis is rather compact and simply asks the question of how the traditional Marshall-Lerner condition has to be changed – ignoring pricing to market behavior aspects and thus simply focusing on real exchange rate changes – if outward foreign direct investment or inward FDI or two-way FDI has to be considered in a broader globalization perspective. The key focus is on the trade balance, but one can certainly extend the analysis to the current account and the exchange rate equilibrium condition, respectively; and from this, to a macro model there are only a few steps as mentioned in the final section.

At the bottom line, the new Marshall-Lerner condition derived here for the case of outward FDI suggests a critical limit that exceeds the previous limit of unity by about 15% - while the cases of pure inward FDI and two-way FDI are not so clear; here, FDI globalization could lead to a requirement where the limit for the sum of the two elasticities, in absolute terms, is below unity. Note, however, the unambiguous finding for the case of a setting with outward FDI: the interplay of the FDI intensity abroad, the foreign profit share in GDP and the share of a country's GDP in global GDP play a key role for the stricter new Marshall-Lerner condition derived.

The next section derives the Marshall-Lerner conditions for a world with FDI before the final section draws key policy conclusions. When one looks at the setting with outward FDI (only), the main insight is that a real devaluation will reinforce imports of goods and services as the real value of profits from abroad (country 2), expressed in domestic goods units of country 1, will increase and therefore there is a stricter requirement on import elasticities than the standard Marshall-Lerner condition suggests. As regards a two-way FDI setting, one can show that a real exchange rate devaluation in country 1 additionally dampens the

GNP in country 2 and therefore makes exports of country 1 more difficult: Thus the potentially even stricter requirement for a trade balance improvement in the two-way FDI case. To the extent that one is more interested in the reaction of the current account to a real depreciation, one may point out that "FDI globalization" is weakening the traditional Marshall-Lerner condition provided that profits of subsidiaries abroad really are fully transferred to the parent companies; if the international transfer of profits takes place only to a rather small extent (for example due to tax incentives in favor of reinvestment abroad which in reality plays a crucial role in some countries, e.g. in China since 2018) – smaller than certain trade parameters – the standard finding presented here namely that FDI globalization leads to a stricter Marshall-Lerner condition than the traditional elasticities requirement, is maintained under certain parameter restrictions. The next section then looks at the role of risk premiums of international investors and the role of capital depreciations, respectively, and the final section draws some policy conclusions.

In a policy perspective, one has no really useful information if the elasticity of imports of country i vis-à-vis all countries (j=1, 2…N) is considered, rather one has to make a distinction across partner countries, namely which pair i-j stands for pure outward FDI (from a country 1 perspective), alternatively those which stand for the case of pure inward FDI and finally – a third country group – representing a two-way FDI case. The following theoretical analysis is also an implicit derivation of the standard trade gravity model – without the distance variable; this is so because in a world with cumulated outward and inward FDI, the import volume will depend on both domestic and foreign GDP.

The subsequent analysis is not a general equilibrium approach, but the building blocks developed here should be easily incorporated in such a more complex approach. As regards recent estimates of the export price elasticities of China, France, Germany, Italy, Japan, UK and the US – over the period 1990-2012 – AIELLO/BONNANO/VIA (2015) have shown that these elasticities are below unity both in the short run and the long run; except for France where the export price elasticity is lower than unity in the short run, but higher than unity in the long run. Looking at large exchange rate changes in a macro perspective yields important results for both high income countries and developing countries (KAPPLER ET AL., 2013). There are also special aspects concerning real domestic income versus real GDP in terms of trade changes as pointed out by KOHLI (2004) with a focus on both Switzerland and other countries – these aspects are not integrated here. Subsequently the distinction between GDP and GNP will, however, play an important role.

The following analysis suggests that a more differentiated approach to export price elasticity/import price elasticity analysis could be very useful. It is clear that estimations of price elasticities could be based on import volumes or on real value-added imports where the latter are imports net of foreign intermediate imports. A standard analysis of the real exchange rate elasticity of the trade balance for Germany, before and after the creation of a monetary union, has been provided by the Monthly Reports of January 1997/1998 where the 1998 Monthly Report (DEUTSCHE BUNDESBANK, 1998) suggests that the elasticities on the German export side is greater in absolute terms than on the import side – strongly influenced by raw materials; and that the elasticities for trade with the Eurozone partner country group differs from that of the non-Eurozone/non-EU countries.

2. Deriving the modified Marshall-Lerner Condition for the Case of Outward FDI

The standard Marshall-Lerner (henceforth referred to as ML) condition says that the trade balance will improve after a real depreciation (real exchange rate q*=eP*/P falls; e is the exchange rate, P the price level, * for foreign variable) if the sum of import elasticities – in absolute terms - in the home country and abroad exceed unity. Many empirical studies have found that the ML condition is not met in the short term but in the long run as adjustment, in the sense of looking for a broader range of substitutes for imported products, takes some time. In an economy with trade and FDI there is a need to make a distinction between real gross domestic product Y and real gross national income Z.

Subsequently, it will be shown that in an economy with cumulated outward foreign direct investment, the condition for the trade balance to improve after a real devaluation is different from the standard ML condition since export volume X is not proportionate to the foreign real gross domestic product Y* but to real foreign gross national product Z*. Real gross national product Z = Y plus net income from abroad where subsequently at first only dividend income from abroad is considered; and the import volume J is assumed to be proportionate to Z.

Let us consider the case of asymmetric cumulated outward FDI (share in foreign capital stock is denoted by α); the question is how the ML condition has to be modified in the context of a change of the trade balance X' and the trade balance ratio (TBR), respectively; TBR is defined as import of goods and services in country 1 units relative to real exports of country 1. It is assumed that the absolute terms for the import elasticities at home and abroad exceed zero. A critical assumption made here is that the sum of the import elasticities at home and abroad in absolute terms – as a new requirement – is smaller than 2; if the sum of elasticities would exceed 2, one has a different case to be studied. The import elasticity in absolute terms is denoted by η and η^*, respectively.

If one considers the trade balance in a standard setting – without foreign direct investment – we can write for the export-import ratio X/(q*J) as simple expression (q*J is the import volume expressed in domestic goods units (parameters x>0, j>0)); specifying $X = xY^*q^{*\eta^*}$ and imports $J = jYq^{*-\eta}$ we get for the export-import ratio $X/(q^*J) = xY^*q^{*\eta^*}/(q^*jYq^{*-\eta})$. Thus taking logs gives $\ln(X/(q^*J)) = (\eta^* + \eta - 1)\ln q^* + \ln(x/j) + \ln(Y^*/Y)$. Hence the export-import ratio will improve after an increase of the real exchange rate only if $\eta^* + \eta > 1$. This is the ML condition. In a world with foreign direct investment one has to consider that exports and imports are proportionate to Z* and Z. If output is produced in both countries according to a Cobb-Douglas production function – as assumed here $Y=K^{\beta}(AL)^{1-\beta}$ and $Y^*=K^{*\beta^*}(A^*L^*)^{1-\beta^*}$; K is capital, A knowledge, L labor, $0<\beta<1$, $0<\beta^*<1$) – and if there is competition in goods and factor markets the capital income share in GDP is β in the home country and β^* in the foreign country (note: the new ML condition derived is independent of the Cobb-Douglas functions considered here).

These aspects are important for deriving a modified Marshall-Lerner condition for the case of outward FDI as has already been emphasized by WELFENS (2012) where both inward

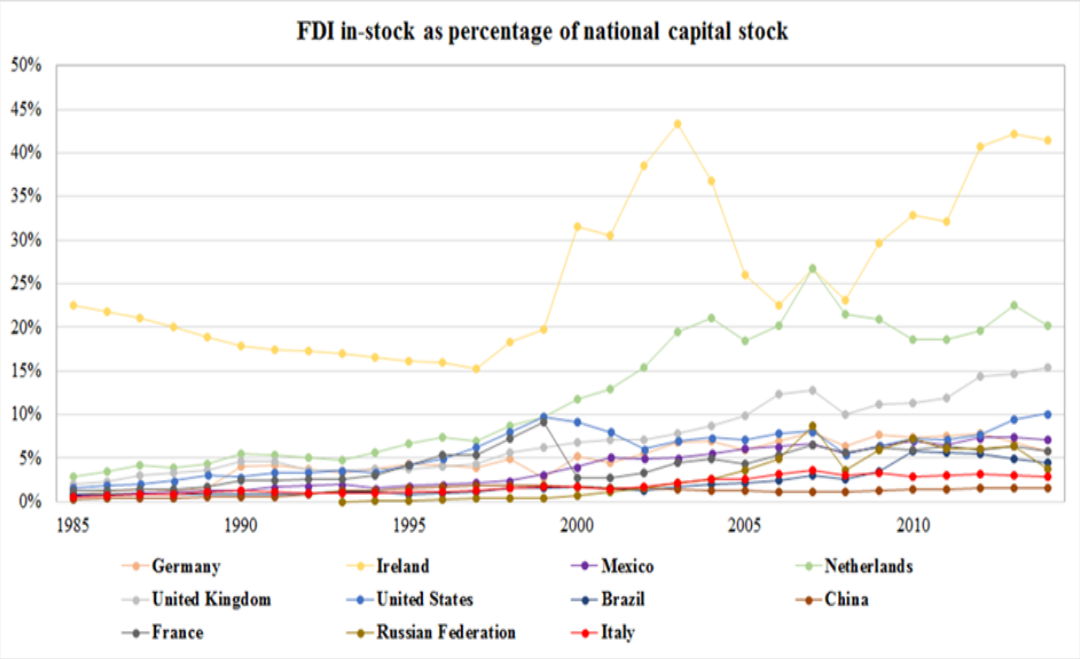
FDI and outward FDI were considered and the importance of the distinction between GDP and real GNP emphasized (WELFENS, 2011). Subsequently, only outward FDI is considered at first and it can be shown how the modified Marshall-Lerner condition should read. It will be assumed that the standard ML is fulfilled, but it will be shown additionally that the sum of the two import elasticities – in absolute terms – will have to remain above a specific critical value (above unity, but below 2) if a real devaluation is to improve the trade balance. In the subsequent trade balance, no international profit transfers are included (one should also remember that until the end of 2017 the US had tax incentives encouraging firms not to repatriate large profits of foreign subsidiaries). This aspect could be considered more explicitly when considering the current account balance. Subsequently the import-export ratio is considered for the case of cumulated outward foreign direct investment.

At the outset it is assumed that the sum of the import elasticities – in absolute terms - is below 2. Note that Z, expressed in domestic goods units, is given by Z= Y + αβ*Y*q*; multiplying profits of subsidiaries abroad by q* translates foreign goods units into goods units of country 1. For ease of exposition in equation (5') the ratio of q*J/X:=TBR (trade balance ratio) is considered so that the modified Marshall-Lerner condition to be derived will consider the condition of ∂TBR/∂q*<0. If one would consider the trade balance in real terms (X'; parameters 0<x<1; 0<j<1), one gets $X' = xY(1-\alpha\beta^*)q^{*\eta^*} - q^* jYq^{*-\eta} - \alpha\beta^* jY^* q^{*2-\eta}$ where the latter term (beyond the factor (1-αβ*) in the export term) is the new element crucial for the necessary modification of the Marshall-Lerner condition in a setup with outward cumulated FDI. With such FDI, imports also depend on foreign GDP and part of imports will react very sluggishly to a real exchange rate change in the sense that only under the extreme case of η>2 would one see an impulse from this term for an improvement of the trade account. The larger αβ*, the higher the FDI-induced reduction of the export term and the larger the unfavorable third term – assuming that η>2 is an unrealistic case. For the understanding of the subsequent analysis it should be clear that, for example, the import volume of, say oil, of the EU or the US, is indeed the real import volume, namely measured in barrels of oil (foreign goods units).

The setup of subsequent equations is clear and (15') gives the result – with λ:= Y/(q*Y*) – of the new Marshall-Lerner condition of an economy with outward FDI: η* + η >1 + 1/(1+λ/(αβ*)). As the derivation is based on the assumption that the sum of both import elasticities exceeds unity, one may indeed write: η* + η> 1 + 1/(1+λ/(αβ*)) which is a stricter condition than the standard Marshall-Lerner condition.

In a world economy with an increasing role of foreign direct investment, the new Marshall-Lerner condition is crucial; it should be useful to understand the reaction of the trade balance of major FDI source countries, particularly with respect to trading partners which themselves have rather low (or indeed zero) outward FDI. To get an idea of the order of magnitude of outward foreign direct investment stocks, some selected statistics for certain countries have been indicated in the subsequent graph – with a focus on inward FDI intensity (cumulated FDI inflows relative to capital stock of host country); appendix 2 also gives information on selected outward FDI stock positions. It is also interesting to take a look at the current account – with a setup of actual international dividend payments.

Figure 1: Foreign Direct Investment Ownership in Selected Countries



Source: EIIW calculations based on data available from UNCTAD and Penn World Table, Version 9.0

The derivation of the new Marshall-Lerner condition for the case of outward FDI is as follows:

(1') $X = xZ^{*}q^{*\eta^{*}}$

(2') $J = jZq^{*-\eta}$

(3') $Z = Y + \alpha\beta^{*}Y^{*}q^{*}$

(4') $Z^{*} = Y^{*}\left(1-\alpha\beta^{*}\right)$

(5') $TBR = \dfrac{q^{*}\, jZq^{*-\eta}}{xZ^{*}q^{*\eta^{*}}}$

(6') $TBR = \dfrac{q^{*}\, j\left(Y+\alpha\beta^{*}Y^{*}q^{*}\right)q^{*-\eta}}{xZ^{*}q^{*\eta^{*}}} = \dfrac{q^{*}\, jYq^{*-\eta} + q^{*}\, j\alpha\beta^{*}Y^{*}q^{*}q^{*-\eta}}{xZ^{*}q^{*\eta^{*}}} =$

$$= \frac{q^{*}\, jYq^{*-\eta}}{xZ^{*}q^{*\eta^{*}}} + \frac{q^{*}\, j\alpha\beta^{*}Y^{*}q^{*}q^{*-\eta}}{xZ^{*}q^{*\eta^{*}}} = \frac{q^{*1-\eta^{*}-\eta}\, jY}{xZ^{*}} + \frac{q^{*2-\eta^{*}-\eta}\, j\alpha\beta^{*}Y^{*}}{xZ^{*}}$$

(7') $\dfrac{\partial TBR}{\partial q^{*}} = \left(1-\eta^{*}-\eta\right)\dfrac{jY}{xZ^{*}}q^{*-\eta^{*}-\eta} + \left(2-\eta^{*}-\eta\right)\dfrac{j\alpha\beta^{*}Y^{*}}{xZ^{*}}q^{*1-\eta^{*}-\eta}$

(8') $\dfrac{\partial TBR}{\partial q^{*}} < 0 \;\; if \;\; \left(1-\eta^{*}-\eta\right)\dfrac{jY}{xZ^{*}}q^{*-\eta^{*}-\eta} < \left(\eta^{*}+\eta-2\right)\dfrac{j\alpha\beta^{*}Y^{*}}{xZ^{*}}q^{*1-\eta^{*}-\eta} \;\Big|\bullet xZ^{*}$

(9') $\left(1-\eta^{*}-\eta\right)\left[\dfrac{Y}{\alpha\beta^{*}\left(\eta^{*}+\eta-2\right)Y^{*}q^{*}}\right] > 1$

This requirement for a normal reaction of the trade balance with respect to a real depreciation is stricter than the traditional Marshall-Lerner condition (η+η*>1) since we can write (recall the assumption that the sum of the absolute import elasticities is below 2):

$$(10')\ 1-\eta^{*}-\eta<\alpha\beta^{*}(\eta^{*}+\eta-2)(q^{*}Y^{*}/Y)$$

$$(11')\ \eta^{*}+\eta>1+\left[\alpha\beta^{*}\left(2-\eta^{*}-\eta\right)\left(q^{*}Y^{*}/Y\right)\right]$$

Equation (11') already shows that the FDI-enhanced ML condition will be stricter than the standard ML condition.

Let us define Y/(q*Y*):=λ which is the ratio of home country GDP relative to foreign GDP (in home country units) or implicitly the initial share of the home country in the world economy. We divide equation (10') by 1 - η* - η (assuming (1- η* - η) <0) and thus obtain as the case of the modified Marshall-Lerner condition (assuming 1< η* + η <2):

$$(12')\ \lambda/(\alpha\beta^{*})>-1-\frac{1}{\left(1-\eta^{*}-\eta\right)}$$

$$(13')\ 1+\lambda/(\alpha\beta^{*})>-\frac{1}{(1-\eta^{*}-\eta)}$$

$$(14')\ 1-\eta^{*}-\eta<-\frac{1}{\left(1+\frac{\lambda}{\alpha\beta^{*}}\right)}$$

$$(15')\ \eta^{*}+\eta>1+\frac{1}{1+\frac{\lambda}{\alpha\beta^{*}}}$$

The higher λ and the smaller α and β*, the easier it is for the modified ML condition to be fulfilled. The term 1/(1+λ/(αβ*)) can be defined as V'. If λ = 0.2, α= 0.1 and β*= 0.33 – these figures correspond roughly to the case of the US or the EU – the sum of the absolute import elasticities should be above a critical upper value of 1 + 1/(1+λ/(αβ*))=1.142 (and, recall, above unity) to fulfill the FDI-modified Marshall-Lerner condition with respect to the trade balance. For a much smaller country (say λ = 0.02) one has to consider that typically α is also smaller (say α= 0.01) so that roughly the same critical range for a modified Marshall-Lerner condition for a trade balance improvement in a small country as for a big economy might be obtained; the relevant statistics for the countries concerned have to be studied. A kind of new elasticity pessimism in a world of trade and outward FDI could be justified only if β* and α would rise over time, while λ is constant or declining. Empirical analysis is required to shed further light here.

Looking at equation (6') one can see that a rise of FDI globalization intensity – in the sense of a rise of α - will raise the import/export ratio TBR. This is obviously indeed the case because an increase of the parameter α will increase imports of goods on the one hand and dampen exports on the other hand; and the respective partial derivative clearly confirms ∂TBR/∂α this insight. Disregarding the general theoretical case considered here, an interesting exception could occur if the source country of FDI is also a major exporter of machinery & equipment so that the parameter x would indirectly be raised by a rise of α

provided that the subsidiaries abroad will have a preference for machinery and equipment from country 1. From this perspective it is interesting to focus on the ranking of major FDI source countries and the ranking of major exporters of machinery and equipment; it seems that Germany, the Republic of Korea and Japan are countries in Europe and Asia that are both major FDI source countries and leading global exporters of machinery and equipment. Thus for these countries a rise of outward FDI intensity is not necessarily linked to a deterioration of the trade balance. In the long run, China could also be in such a position since by 2017 it had already become a major exporter of machinery and equipment and China's outward FDI growth has been considerable in the decade after 2006.

Long Run Perspective

One may note that, in the interest of simplicity, the above equation has neglected the aspect of capital depreciation (the depreciation rate will be denoted as δ). If one wants to include this aspect for the case of outward FDI only, the formula derived contains a slight overestimation of the impact of β* - as can be shown for the long run which will be defined here as fulfilling the profit maximization equation βY/K - δ= r where r is the real interest rate (i is the nominal interest rate). This condition should be in line with money market equilibrium (M is the stock of money, h, h' are positive parameters) in the form of M/P = hY/(h'i) and therefore with price stability – and defining h":= h/h' - we will have real interest rate r = h"Y/(M/P). The central bank is assumed to aim at price stability and it does so by maintaining a constant ratio M/Y = μ' so that (M/Y)= μ' = h"P/r and therefore r= h"P/μ' and with arbitrage in international goods markets r=h"eP*/μ'; the monetary policy parameter μ' is exogenous only under flexible exchange rates.

In a world with capital depreciation abroad (δ*), to reflect the profits accruing from abroad one has to write for net profits: β*αY*q* - δ*αK*eP'*/P' where P' is the stock market price; for simplicity P'*=P* will be assumed and for country 1 the simple equation P'=P. From profit maximization abroad, in a setting with the Cobb Douglas production function defined above in country 1 and country 2 respectively, one can simply write due to β*Y*/K* = r* + δ* for the foreign capital stock (note: r* could be replaced by a monetary policy parameter) and therefore:

$$(16') \quad K^* = \frac{\beta^* Y^*}{(r^* + \delta^*)}$$

Hence – if one takes into account a risk premium R" (typical for US investment, for example, in other countries) - net profits accruing from abroad are:

$$(17') \quad \alpha(1+R'')Y^* q^* \beta^* - \frac{\delta^* \alpha \beta^* Y^* q^*}{(r^* + \delta^*)} = \alpha\left((1+R'') - \frac{\delta^*}{(r^* + \delta^*)}\right) Y^* q^* \beta^*$$

One should not overlook that the effective deprecation rate abroad is often much lower than 10% (a figure which is often used in industry studies) since there is production abroad in many plants that have been depreciated fully on the firms' books but which are still producing so that an effective deprecation rate of 3% on MNC's assets abroad could be more realistic; and the real interest rate could be 3% which amounts to reducing the impact of α. However, one should also consider that outward FDI typically is associated with a risk

premium so that the share of profits obtained by the parent companies will not be equal to α but to α(1+R") where R" is the implicit risk premium which, in turn, means that the effective impact of α could be about 2/3rds of that parameter (on the risk premium of US outward FDI see e.g. HUNG/MASCARO (2004, p.2) who state that the yield on US owned assets averaged 5.82% from 1982-2003, whereas that of foreign-owned assets was 4.59% over the same period; the difference between the two yields relative to 4.59% is 26.8%). Hence the formula (15') is an overstatement of the role of β* for a world with FDI outward globalization of about 1/3rd, however, the order of additional magnitude for the new Marshall-Lerner condition could still be about 10% to 20% - the sum of the two import elasticities thus could instead be required to exceed 1.2 for the pure outward FDI case and this restatement of the Marshall-Lerner condition should not be ignored by policymakers and governments (e.g. consider a country with λ =0.03, α=0.10 and ß=0.4 which give a critical value of 1.12).

This is all the more important since the tendency of multinational companies to strongly rely on offshoring suggests that the import elasticity for intermediate products from offshore subsidiaries will decline since highly specialized intermediate products are imported and for part of the imported intermediate products obtained via international outsourcing a similar argument can be made. FDI globalization could indeed make trade balance adjustment via a real depreciation more difficult than in a pure trade world.

In standard empirical studies on trade analysis, imports are usually stated as being proportionate to C+I+G which is rather adequate since with $J = jYf\left(q^*\right)$ or $J = jZf\left(q^*\right)$ or $X = xY^* f^*\left(q^*\right)$ or $X = xZ^* f^*\left(q^*\right)$, one has the endogenous variable on both sides which brings estimation problems. One could test whether or not $\lambda = Y/\left(q^*Y^*\right)$ has a significant impact on exports – indeed this was done in an approach where the non-standard link to Y and Y* also was considered. The r^2 was rather low, but $Y/\left(q^*Y^*\right)$ was found to be significant for several (individual) OECD countries – including the US – which were covered; with short run and long run elasticities of the real exchange rate estimated (WELFENS/IRAWAN (2014)).

A possibly better approach for an economy i with partner countries for which i's outward FDI position dominates is to consider the function J, namely

$J = j\left(C + \mathrm{I} + \mathrm{G} + \alpha\left(1+R''\right)\beta^* Y^* q^* - \delta^* \alpha K^* q^*\right)q^{*-\eta}$ and therefore – within a medium term approach that assumes profit maximization abroad, namely $\beta^* Y^*/K^* - \delta^* = r^*$ - the replacement of K* in the import function J leads to:

$$(18')\ ln\, J = ln\, j - \eta ln q^* + ln\left(C + I + G + q^* Y^* \alpha\beta^*\left(\left(1+R''\right) - \frac{\delta^*}{\left(\delta^* + r^*\right)}\right)\right)$$

Note that with reference to the US, and the HUNG/MASCARO figures on the US outward FDI risk premium calculated above, R" would be 0.27. The third RHS term in equation (18') may be dubbed the effective medium-term domestic absorption. The export function in the asymmetric FDI case considered could be stated as

$$(19')\ X = x\left[C^*+I^*+G^* - Y^*\alpha\beta^*\left(\left(1+R''\right) - \frac{\delta^*}{\left(\delta^* + r^*\right)}\right)\right]q^{*\eta^*}$$

$$(20')\ lnX = lnx + ln\left[C^*+I^*+G^* - Y^*\alpha\beta^*\left(\left(1+R''\right) - \frac{\delta^*}{\left(\delta^* + r^*\right)}\right)\right] + \eta^* lnq^*$$

These estimates should be rather easy for the United States and its trade with, say, China. For the EU's trade with China, a similar approach could be applied. At least until 2010, the US was clearly a dominant FDI source country in China; and for the EU's trade with China, it is also obvious that the European Union was a dominant FDI source country for China over the period 1980-2010. A key challenge could emerge in the context of China's economic and technological catching-up: While China in the 1980s and 1990s was exporting mainly low-technology products with high price elasticities, the first decade of the 21st century was increasingly characterized by growth in China's export of rather knowledge-intensive and capital-intensive products. While the export of the US is largely shaped by knowledge-intensive, high-technology products with rather low price elasticities – and a similar logic applies to the Eurozone's export growth to China - after 2000, China's exports became less price sensitive if one considers the structural composition of Chinese exports over time. Whether or not the sum of import elasticities in US-China trade exceeds 1+V' (the critical limit in the form of the new Marshall-Lerner condition) is unclear for the decade after 2000 and hence the high bilateral Sino-US trade imbalance could be improved by a bilateral real depreciation of the $. Again, a similar logic applies to Eurozone-China trade in the first decade of the 21st century (for the EU's export composition see VANDENBUSSCHE, 2014). Thus there is much work to be done on empirical analysis. Appendix 3 gives an overview of those countries where the US is mainly an FDI source country as well as other cases, namely where the US is mainly a host FDI country or cases where the US is characterized by two-way FDI relations. In addition, similar info is given for the UK which faces critical adjustment challenges in the event of the envisaged BREXIT.

Furthermore, one may consider the impact factors q*, Y/(q*Y*) and α and β* in the function F(…) in a form that allows a logarithmic estimation equation for the import function and the export function, respectively. An impact of λ, α and β* here would be considered to be part of the implicit "overall price elasticity" so that the modified Marshall-Lerner requirement for the estimated elasticity of q* could be jointly considered with the estimated coefficients for λ, α and β*; hence one would have a basis to determine whether or not the modified Marshall-Lerner condition is met or not.

In a panel data analysis, trading partner countries could be grouped into countries for which country i'=1,2…N is a dominant FDI source country, FDI host country or a country with two-way FDI links. Finally, one may not want to consider gross exports and gross imports, respectively, rather one could estimate net value export and net value import functions using data from the TiVA database and other databases. The price elasticities of both approaches could be compared and will give useful new insights.

In International Economics, the Marshall-Lerner condition is one of the crucial pillars for understanding trade balance adjustment dynamics and with FDI globalization the modified Marshall-Lerner condition thus should be of particular interest: in a pure outward FDI setting, trade balance adjustment – in the sense of correcting a high trade balance deficit via

a bilateral real deprecation - is more difficult, the lower the country's share in world GDP and the higher the share in the foreign capital stock and the higher the foreign profit share in foreign GDP are. From a US-China trade balance perspective for 2000-2020, one may argue that the US has a favorable position as it has a rather high share in world GDP – although it is declining over time in general and relative to China's GDP in particular; but the US share in China's capital stock has increased over time and the profit ratio in China is fairly high (for the Eurozone/the EU and China, a similar perspective holds over the same time period). If the US trade balance adjustment should thus be difficult to achieve in the US-China case through a real depreciation of the $ vis-à-vis the renminbi, it would be all the more important that the US Administration does what can be done, namely reducing the relative price of non-tradable goods relative to tradable goods and to increase the domestic savings rate through certain tax incentives. The Trump Administration has done nothing in this direction. An adverse endogenous bilateral trade balance correction, which one may expect in the US-China case, could come from US subsidiaries in China that lobby for enhanced US market access for Chinese firms, above all US subsidiaries in China – a general approach for endogenous market access in host countries through subsidiaries has been developed by BLANCHARD/MATSCHKE (2012) who also provide empirical evidence for US multinational companies which indeed facilitate access to the US market. Moreover, there is an argument from research on the knowledge production function that the presence of multinationals' subsidiaries will raise innovativeness and this in turn should stimulate the exports of the host countries – for a theoretical basis and empirical evidence on EU countries see JUNGMITTAG/WELFENS (2016). If one wants to integrate these particular aspects into the framework of a modified Marshall-Lerner approach, one would have to rewrite - with j' and j'' standing for positive parameters related to the Blanchard-Matschke and the Jungmittag-Welfens effect, respectively - the enhanced import function as $J = j\left(1+\left(j'+j''\right)\alpha\right)\left(Y+\alpha\beta^{*}Y^{*}q^{*}\right)q^{*-\eta}$. The role of α as a critical globalization parameter in the new Marshall-Lerner condition would be reinforced and again the modified Marshall-Lerner even stricter than in equation (15'). One should note that disentangling the Blanchard-Matschke effect from the Jungmittag-Welfens effect in empirical research could be quite complicated. If one integrates the Blanchard-Matschke argument and the Jungmittag-Welfens effect in the case of pure inward FDI or two-way FDI, the relevant new Marshall-Lerner conditions become more tedious to calculate, but computer simulation in modernized macro models could help to get a better understanding of the dynamics – a relevant point for the standard models on the EU, the US, Japan or China.

3. Policy Conclusions and Further Research

It is fairly obvious that in an economy with asymmetric outward FDI, the change of the size of the import elasticities over time - small in the short term, higher in the medium term and even larger in the long run – could become a distinct source of output instability in an underemployed economy as $Y = C(\ldots)+I(..)+G+X^{net}(Y, Y^*, q^*, \alpha, \alpha^*)$; here, X^{net} is the real trade balance. The elasticity of X^{net} with respect to q* might be negative in the short run, but is possibly above unity in the medium and long run. Finally, one may note that the tendency of firms to create international production networks could contribute to rather small import elasticities in absolute terms (but the sum of import elasticities in a North-South perspective

could still exceed unity – where countries in the South export intermediate products and import final products which contain those intermediate products). From a policy perspective, one may argue that government can adopt measures to improve FDI globalization, namely to encourage higher FDI inflows as, for example, has been emphasized for decades by Singapore; moreover, government could try to encourage the creation of multinational companies, for example by stimulating a more technology-driven and innovation-oriented production of goods and services which in the end will help some of the leading firms to successfully build up production in foreign subsidiaries; typically based on ownership specific advantages and technology, respectively – here the argumentation is following the view of DUNNING (1979).

Protectionist policies causing tariff-jumping FDI could undermine trade balance adjustment via the real exchange rate: If, for example, the Trump Administration complains about a large US trade imbalance and then imposes import tariffs on metals and certain products – or simply threatens to do so with more products – this is quite contradictory not only because Trump's economic policy stimulates output and hence imports so that the trade imbalance will indeed increase due to the President's economic policy; but it also reinforces the globalization terms in the modified Marshall-Lerner condition for the two-way FDI case (see appendix 1) so that real exchange rate changes have to be bigger for a corrective impact than would otherwise be the case. Thus the Trump Administration implicitly pushes for higher global exchange rate volatility which in turn could cause higher output volatility and hence additional welfare losses worldwide – one can be certain that the key trade policy advisers of President Trump have not considered these aspects thus far. The simple arguments presented here might have an enlightening effect on policymakers interested in dealing with trade imbalances in an adequate and rational way.

As regards the theoretical result for the two-way FDI case, one can see from the modified ML result (8".2) that it is unclear whether or not the modified Marshall-Lerner condition is stricter than the traditional ML condition. The appendix also shows a fairly compact condition for the case of pure inward FDI to lead to a stricter modified condition than a traditional ML condition. Empirical research about the various parameter restrictions would be useful and in any case one should not expect the Marshall-Lerner condition in the context of FDI globalization situation to the same as in the case of a pure trade globalization setting. One may argue that it will be interesting to observe how long it takes for the sum of the two import elasticities in absolute terms to meet the modified stricter ML-requirement. All the import elasticity conditions are, of course, also quite relevant in the context of import tariffs which change the international relative price $q^*(1+b"\tau")/(1+b"^*\tau"^*)$ where $\tau"$ is the import tariff rate of country 1 and $\tau"^*$ is the foreign import tariff rate; b" and b"* are pricing-to-market parameters and could be in the range of -1 to +1. If import tariffs are imposed only by country 1, there will be a real appreciation effect in a system of flexible exchange rates and this, in turn, will reverse the initial trade balance improvement from imposing sectoral import tariffs – provided that the modified ML conditions are met. Two-way FDI countries as well as cases of countries with asymmetric FDI (either only/mainly outward FDI or only/mainly inward FDI) should be studied carefully. It will be crucial to consider bilateral and global trade balance/current account balance adjustment options for countries which are both major source and host countries of FDI, such as the US, Canada, Switzerland, most western EU countries, Korea, Japan, Singapore and other ASEAN countries as well as China.

Obviously, an interesting challenge for future research would be to find out for which countries the medium term witnesses the case that the sum of absolute import elasticities exceed the critical value 1+V'. The relevant empirical results will bring interesting policy conclusions when it comes to the debate about critical trade imbalances. One may point out that there is also an interesting question with respect to equilibrium in the foreign exchange market as one can write as an equilibrium condition – with portfolio capital inflows V(r-r*) and foreign direct investment inflows in the form of FDI inflows (international mergers & acquisitions) V"q*: $V(r-r^*) + V''q^* = q^*jZq^{*-\eta} - xZ^*q^{*\eta^*}$ where V>0, V">0. The term V"q* reflects the argument of FROOT/STEIN (1991) according to which FDI inflows in a setup with imperfect capital markets are a positive function of the real exchange rate as the foreign bidders – facing competition of domestic bidders in the target country – will have higher equity capital (expressed in the currency of the target country) after a real depreciation of the foreign currency. The above condition for an equilibrium in the foreign exchange market has been stated here without international profit payments; if those are to be included, one has to add on the RHS $v'\alpha^*\beta Y$ (v' and v'* stand for the percentage of profits repatriated by subsidiaries in country 1 and country 2, respectively) and also the additional term – $v'^*\alpha\beta^*Y^*q^*$. These are interesting perspectives for macroeconomic modeling and indeed, for example, for an enhanced Mundell Fleming model with outward FDI. In the goods market, consumption would be proportionate to disposable GNP. Investment could be written as $b(\beta Y/K - r - \delta)$ where b is a positive parameter and $\beta Y/K$ is the marginal product of capital if the macro production function is $Y=K^{\beta}(AL)^{1-\beta}$; δ is the depreciation of K.

Whether or not a real depreciation leads to an improvement of the real current account position in the medium term is for instance crucial to the case of BREXIT (WELFENS, 2017). Some aspects of the link between the current account and real depreciation in the context of inward FDI and outward FDI are mentioned in the appendix. As regards BREXIT, it is clear that the real depreciation to be expected from BREXIT could, on the one hand, improve the current account of the UK in the medium term, on the other hand a rather limited free trade agreement between the UK and the EU will raise the UK's current account deficit. This in turn would shift the F*F*-curve in the Branson model upwards which simultaneously determines the equilibrium in the money market, the domestic bonds market and the foreign bonds market - with the F*F*-curve indicating in e-i space (i is the nominal interest rate which in a setting with a stable price level is equal to the real interest rate r) the equilibrium condition in the foreign bonds market while the MM-curve indicates the equilibrium condition in the money market. A fall of the stock of foreign bonds (F*, denominated in foreign currency) due to a current account deficit implies a downward shift of the MM-curve (and possibly also a downward rotation) so that the fall of F* due to a current account deficit will in any case lead to an interest rate increase and most likely also to a nominal depreciation of the currency.

At the bottom line it is clear that looking empirically at the Marshall-Lerner condition for all trading partner countries on an aggregated basis does not make much sense. The trading partners will have to be grouped according to the FDI links and dominant FDI directions, respectively. Partners where country 1 is mainly a source country of FDI, countries where country 1 is mainly a host country, and the case of mixed FDI relations. A disaggregated set of estimates for import elasticities for the three groups mentioned has to be analyzed – otherwise the results of lumped countries would be quite misleading for policymakers. It is also clear that the dominant FDI position of a pair of countries can change over time: For

example, in 2000 the US still was dominantly a host country of FDI for China while in 2016 there was more of a two-way FDI relationship between the two countries. A similar view is relevant for EU-Sino trade and the FDI relations at these two points of time. All of this does not, of course, consider the impact of changing trade composition over time on the absolute size of import elasticities. One may assume that countries with strong MNC production activities have rather low absolute import elasticities for imports from subsidiaries abroad – reflecting off-shoring - since intra-company trade with intermediate products should be highly specialized and complementary (the latter referring to the intermediate product and the final good produced). MNCs' imports from international outsourcing partners should, however, stand for rather high import elasticities since the level of technological sophistication and knowledge-intensity typically will be lower than for the import of intermediate products in the context of offshoring.

The most important case to study regarding the relevance of the new Marshall-Lerner condition is the UK for which BREXIT will bring about considerable economic challenges, including strong real exchange rate movements. However, as was already visible in the EU referendum year of 2016, a real Pound depreciation brings a high FDI inflow, while a year later – with public interest focused more on the question of future UK market access to the EU27 – FDI inflows had reduced enormously (according to OECD: -92% compared to 2016; -18% for the global FDI inflow (OECD, 2018)) while outward UK FDI had strongly increased; possibly showing first signs of tariff-jumping investment by UK firms. The new Marshall-Lerner condition will help to better understand trade and current account adjustments.

Naturally, the aspects highlighted above will be quite important for national policymakers eager to cope with unsustainable trade balances; and the IMF should indeed consider the new results which require splitting countries into a mainly FDI source country group, dominantly FDI host country group and a two-way FDI mixed group of countries (see appendix 3 where some countries shown for the case of the US in a dominant source country position concerns relatively poor countries such as India, Brazil and Malaysia, but other countries are advanced countries) – this would be a deviation from the standard split of countries into high income countries, low income countries, emerging economies and natural resource exporters.

Finally, one can raise a question about the maximization of the current account-GDP ratio through an adequate exchange rate policy which could be an option for the anchor country in a fixed exchange rate system. If a government – such as the US Administration under President Trump – is focused primarily on the trade balance, the question could be rather to maximize the trade balance surplus relative to GDP. An alternative to basic theoretical considerations here could be computer simulations to find the respective answer in a broader general equilibrium perspective, assuming that an adequate medium-term time horizon has been identified for which the modified Marshall-Lerner condition holds. To minimize the ratio of imports to exports (expressed in domestic goods terms) is an interesting starting point and one should recall equation (7'):

$$(7')\quad \frac{\partial TBR}{\partial q^*} = \left(1-\eta^*-\eta\right)\frac{jY}{xZ^*}q^{*-\eta^*-\eta} + \left(2-\eta^*-\eta\right)\frac{j\alpha\beta^*Y^*}{xZ^*}q^{*1-\eta^*-\eta}$$

If we want to set this equation to zero – as a necessary condition – for a minimum, we obtain:

(21') $(1-\eta^*-\eta)\frac{jY}{xZ^*}q^{*-\eta^*-\eta} = -(2-\eta^*-\eta)\frac{j\alpha\beta^*Y^*}{xZ^*}q^{*1-\eta^*-\eta}$

Hence the minimizing trade balance deficit real exchange rate is given – assuming that $1<\eta^*+\eta<2$ – by:

(22') $q^{*min} = \left(\frac{Y}{Y^*}\right)\left(\frac{1-\eta^*-\eta}{(\alpha\beta)(\eta^*+\eta-2)}\right)$

Note: From a practical perspective, the trade balance deficit minimizing real exchange rate can obviously only be a concept for a big economy and the variable that can be manipulated by policymakers is the nominal exchange rate. The higher α, the higher β^* and the higher Y^*/Y, the lower will be the value of q^{*min}. This is a minimum of the import-export ratio only if the second derivative of equation (7') is positive. Hence the requirement is:

(23') $(1-\eta^*-\eta)(-\eta^*-\eta)Yq^{*min\,-\eta^*-\eta-1} > -(2-\eta^*-\eta)(1-\eta^*-\eta)\alpha\beta^*Yq^{*min\,-\eta^*-\eta}$

We can rearrange the equation and in (25') q^{*min} has been inserted:

(24') $\frac{(\eta^*+\eta)Y}{(q^{*min}Y^*)} > (2-\eta^*-\eta)\alpha\beta^*$

(25') $\frac{(\eta^*+\eta)\left(\frac{Y}{Y^*}\right)}{\left(\frac{\left(\frac{Y}{Y^*}\right)(1-\eta^*-\eta)}{(\alpha\beta^*)(\eta^*+\eta-2)}\right)} > (2-\eta^*-\eta)\alpha\beta^*$

(26') $-\frac{(\eta^*+\eta)(2-\eta^*-\eta)(\alpha\beta^*)}{(1-\eta^*-\eta)} > (2-\eta^*-\eta)\alpha\beta^*$

(27') $\frac{\eta^*+\eta}{\eta^*+\eta-1} > 0$

Since $1<\eta^*+\eta$, the equation (27') is true and therefore q^{*min} is the minimum of equation (7').

Countries in a flexible exchange rate system might want to know the real exchange rate which minimizes the current account surplus – if the real (weighted) exchange rate should move towards this position, government would have a strong incentive to avoid such a situation since it would bring about a high growth of foreign indebtedness provided that the current account is negative. This is a task for future research.

Appendix 1: Outward and Inward FDI: More Restrictive New Marshall Lerner Condition

The initial point of reference is the trade balance for the case of outward cumulated FDI: Net real exports of goods and services X' can be written as:

$$(1'')\ X' = xZ^{*}q^{*\eta^{*}} - q^{*}\, j[Y + \alpha\beta^{*}Y^{*}q^{*}]q^{*-\eta}$$

However, with inward and outward FDI, the definitions of Z* and Z are as follows:

$$(2'')\ Z^{*} = Y^{*}(1-\alpha\beta^{*}) + \alpha^{*}\beta Y / q^{*}$$

$$(3'')\ Z = Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}$$

$$(4'')\ X' = x[Y^{*}(1-\alpha\beta^{*}) + \alpha^{*}\beta Y / q^{*}]q^{*\eta^{*}} - q^{*}\, j\{Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}\}q^{*-\eta}$$

The total differential yields for given Y and Y*:

$$(5'')\ dX'/dq^{*} = \eta^{*}q^{*\eta^{*}-1}x(Y^{*}(1-\alpha\beta^{*}) + \alpha^{*}\beta Y / q^{*}) - q^{*\eta^{*}}x\alpha^{*}\beta Y / q^{*2}$$
$$-((1-\eta)q^{*-\eta}\ j(Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}) + q^{*1-\eta}\ j\alpha\beta^{*}Y^{*})$$

$$(6'')\ dX'/dq^{*} = \eta^{*}q^{*\eta^{*}-1}x(Y^{*}(1-\alpha\beta^{*}) + \alpha^{*}\beta Y / q^{*}) - q^{*\eta^{*}}x\alpha^{*}\beta Y / q^{*2}$$
$$-((1-\eta-\eta^{*})q^{*-\eta}\ j(Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}) + q^{*1-\eta}\ j\alpha\beta^{*}Y^{*})$$
$$-\eta^{*}q^{*-\eta}\ j(Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*})$$

Hence we have for the modified Marshall-Lerner condition in the case of two-way FDI:

$$(7'')\ dX'/dq^{*} = \eta^{*}q^{*\eta^{*}-1}x(Y^{*}(1-\alpha\beta^{*}) + \alpha^{*}\beta Y / q^{*}) - q^{*\eta^{*}}x\alpha^{*}\beta Y / q^{*2}$$
$$-((1-\eta-\eta^{*})q^{*-\eta}\ j(Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}) + q^{*1-\eta}\ j\alpha\beta^{*}Y^{*})$$
$$-\eta^{*}q^{*-\eta}\ j(Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}) > 0$$

This requires (with H:= $q^{*-\eta}\, j\{Y(1-\alpha^{*}\beta) + \alpha\beta^{*}Y^{*}q^{*}\}$):

$$(8'')\ -[\eta^{*}q^{*\eta^{*}-1}x(Y^{*}(1-\alpha\beta^{*})+\alpha^{*}\beta Y/q^{*})+q^{*\eta^{*}}x\alpha^{*}\beta Y/q^{*2}$$
$$-q^{*1-\eta}\ j\alpha\beta^{*}Y^{*}]/H+\eta^{*}<-1+\eta+\eta^{*}$$

$$(8''.1)\ \eta+\eta^{*}\ >\ 1-[\eta^{*}q^{*\eta^{*}-1}x(Y^{*}(1-\alpha\beta^{*})+\alpha^{*}\beta Y/q^{*})+q^{*\eta^{*}}x\alpha^{*}\beta Y/q^{*2}$$
$$-q^{*1-\eta}\ j\alpha\beta^{*}Y^{*}]/H+\eta^{*}$$

The two-way FDI case is rather tedious in terms of the RHS. The terms which would make the modified Marshall-Lerner conditions stricter are $-q^{*1-\eta}\ j\alpha\beta^{*}Y^{*}/H+\eta^{*}$. Hence a relatively large import ratio j could lead to such a stricter case. The other elements of the squared bracket term would attenuate the elasticity requirement. If α is zero, so that one has the case of asymmetric inward FDI leads to the following equation

$$(8''.2)\ \eta+\eta^{*}\ >\ 1-[\eta^{*}q^{*\eta^{*}-1}x(Y^{*}+\alpha^{*}\beta Y/q^{*})+q^{*\eta^{*}}x\alpha^{*}\beta Y/q^{*2}]/H+\eta^{*}$$

The conclusion is that for the case that the squared bracket term/H is smaller than η^{*} the modified Marshall-Lerner condition for an economy with inward FDI is stricter than the traditional ML condition.

Basic Current Account Aspects of a Real Devaluation

It should be noted that one could also consider the current account (CA:= current account) adjustment problem in the sense that a similar approach would be useful to determine the condition for dCA/dq*>0. On the supply side for foreign exchange we have the profits accruing from subsidiaries abroad (αβ*Y*q*), on the demand side for foreign exchange we have the profits of foreign subsidiaries in the home country (α*βY). The relevant CA elasticity condition is crucial since the current account is the relevant condition for the development of foreign indebtedness over time – once there is a current account deficit. If one considers the current account with both cumulated inward FDI and cumulated outward FDI, the additional terms is the term for profit transfers from subsidiaries abroad, namely v'αβ*Y*q* - where v' (0<v'<1) is the percentage of profits made abroad that is transferred to parent companies and which therefore contributes to an additional supply of foreign exchange; at the same time there is a second term v'*α*βY/q* where v'* (0<v'*<1) is the share of profits of subsidiaries in country 1 that is transferred to the parent companies in country 2.

Appendix 2: Selected Outward FDI Stock Data (% of Source Country Capital Stock)

Outward FDI Stock as Percentage of the source country capital stock. 1980 vs 2014

Country	Outward FDI Stock available since:	Outward FDI Stock as Percentage. in 1980:	Rank 1980:	Outward FDI Stock as Percentage. in 2014:	Rank 2014:
British Virgin Islands	1998			24384.90%	1
Cayman Islands	1980	10.5%	1	824.81%	2
Malta	1992			171.47%	3
Cyprus	1987			126.09%	4
Luxembourg	2002			90.62%	5
China. Hong Kong SAR	1980	0.1%	31	87.14%	6
Ireland	1985			61.70%	7
Switzerland	1983			60.65%	8
Liberia	1980	7.5%	5	39.59%	9
Singapore	1980	1.2%	17	39.59%	10
Netherlands	1980	7.7%	4	29.51%	11
Barbados	1980	0.4%	22	24.34%	12
Sweden	1980	0.9%	21	23.37%	13
Belgium	1980	1.4%	16	19.66%	14
Canada	1980	2.8%	8	17.41%	15
Iceland	1985			15.89%	16
United Kingdom	1980	3.5%	7	15.82%	17
Denmark	1980	0.9%	20	15.12%	18
Norway	1980	0.3%	26	13.50%	19
Austria	1980	0.2%	29	12.27%	20
United States	1980	2.3%	9	11.56%	21
Australia	1980	0.9%	19	11.03%	22
Finland	1980	0.3%	24	10.69%	23
France	1980	1.2%	18	10.57%	24
Israel	1980	0.0%	40	9.80%	25
Germany	1980			9.48%	26
Bahamas	1998			8.73%	27
Taiwan (Province of China)	1980	8.5%	3	8.47%	28
Azerbaijan	1996			8.46%	29
Chile	1980	0.1%	32	8.09%	30

Bermuda	1997			7.28%	31
Malaysia	1980	0.4%	23	6.80%	32
Kuwait	1980	2.1%	10	6.79%	33
South Africa	1980	1.4%	15	6.41%	34
Japan	1980	1.7%	13	6.18%	35
Bahrain	1980	3.5%	6	6.10%	36
Togo	1998			6.00%	37
Spain	1980	0.2%	30	5.98%	38
Russian Federation	1993			4.21%	39
Qatar	1995			4.06%	40
Estonia	1992			4.01%	41
Italy	1980	0.3%	25	3.94%	42
New Zealand	1982			3.86%	43
Hungary	1990			3.85%	44
Korea. Republic of	1980	0.1%	34	3.72%	45
Kazakhstan	1997			3.45%	46
United Arab Emirates	1981			3.25%	47
Lebanon	1984			3.12%	48
Portugal	1980	0.2%	28	3.04%	49
Seychelles	1980	2.0%	11	2.72%	50
China. Macao SAR	2001			2.71%	51
Angola	1990			2.49%	52
Georgia	1999			2.34%	53
Brunei Darussalam	1992			2.26%	54
Colombia	1980	0.1%	33	2.25%	55
Slovenia	1992			2.20%	56
Mexico	1980	0.2%	27	2.15%	57
Aruba	1991			2.12%	58
Panama	2009			2.05%	59
Greece	1986			1.78%	60
Philippines	1980	0.0%	38	1.70%	61
Thailand	1980	0.0%	42	1.65%	62
Argentina	1980	1.6%	14	1.65%	63
Mauritius	1989			1.61%	64
Costa Rica	1980	0.0%	37	1.55%	65
Montenegro	2008			1.44%	66
Croatia	1992			1.36%	67
Oman	2003			1.30%	68
Poland	1981			1.27%	69
Brazil	1980	2.0%	12	1.25%	70

Belize	1984			1.25%	71
China	1981			1.24%	72
Honduras	2004			1.17%	73
Lithuania	1995			1.13%	74
Venezuela (Bolivarian Rep. of)	1980	0.0%	44	1.13%	75
Fiji	1980	0.1%	36	1.12%	76
Czech Republic	1993			1.03%	77
Turkey	1985			1.01%	78
Saudi Arabia	1980	0.0%	39	0.81%	79
Armenia	2003			0.69%	80
Serbia	2008			0.67%	81
Bulgaria	1987			0.62%	82
Slovakia	1993			0.61%	83
Botswana	1980	10.5%	2	0.58%	84
India	1980	0.0%	41	0.57%	85
Zimbabwe	1983			0.55%	86
Egypt	1980	0.1%	35	0.52%	87
Nigeria	1980	0.0%	43	0.52%	88
Viet Nam	2005			0.52%	89
Cambodia	1992			0.50%	90

Source: Outward FDI Stock from UNCTAD; last accessed on 25 July 2018; Capital Stock was taken from the Penn World Tables 9.0; last accessed on 25 July 2018.

Appendix 3: US and UK: Characterization as Dominant Outward Stock Country (*) versus Dominant Inward Country (**) Versus Two-Way FDI (***)

Benchmarking year for ranking is 2012; for some countries the assignment would differ if 2002 would be taken as benchmark; US was mainly FDI source country for some NICs, but also for some high income countries in 2012

		US	FDI Inward Stock US		FDI Outward Stock US	
#trade		1=source 2=host 3=both	2002	2012	2002	2012
1	China (*, brown)	1	385,000,000	5,154,000,000	39,889,000,000	70,190,090,000
19	Hong Kong	1	2,005,000,000	6,283,000,000	20,825,853,000	38,049,158,000
18	Singapore	1	1,530,000,000	26,244,000,000	19,855,917,000	87,834,001,000
16	Vietnam	1	0	44,000,000	181,000,000	1,064,000,000
3	Mexico	1	7,829,000,000	14,883,000,000		198,833,330,000
9	India	1	227,000,000	5,158,000,000		32,561,517,000
12	Brazil	1	923,000,000	3,590,000,000		113,439,975,000
17	Malaysia	1	336,000,000	662,000,000		15,485,829,000
13	Netherlands (**, yellow)	2	145,596,000,000	274,904,000,000	81,565,750,000	70,379,196,000
8	France	2	133,914,000,000	209,121,000,000	52,011,301,000	102,022,641,000
5	Germany	2	138,301,000,000	199,006,000,000	48,330,366,000	99,075,100,000
14	Switzerland	2	118,342,000,000	203,954,000,000	47,393,496,000	94,702,051,000
4	Japan	2	147,372,000,000	308,253,000,000	35,584,793,000	61,592,119,000
20	Belgium	2	9,777,000,000	88,697,000,000		27,989,761,000
7	United Kingdom (***, blue)	3	211,699,000,000	486,833,000,000	200,825,564,000	425,237,568,000
2	Canada	3	92,529,000,000	225,331,000,000	146,597,873,000	328,074,759,000
15	Ireland	3	27,302,000,000	24,917,000,000	33,597,186,000	15,597,952,000
10	Italy	3	6,830,000,000	23,260,000,000	15,445,246,000	15,311,062,000
6	South Korea	3	2,932,000,000	24,467,000,000	8,672,033,000	29,818,238,000
11	Taiwan	3	4,000,000	0	0	0

Note: *If outward stock is at least double the inward stock, US is labeled as main FDI source country. **If FDI Inward stock is at least twice as large as outward FDI stock, the US is labeled an FDI host country for the respective countries ***Two-way FDI. Source: UNCTAD

		UK	FDI Inward Stock UK		FDI Outward Stock UK	
#trade		1=source 2=host 3=both*	2002	2012	2002	2012
3	China (*, brown)	1	0	1,846,259,000	10,696,000,000	17,666,000,000
9	Italy	1	9,329,104,000	13,914,794,000	14,760,446,000	33,196,287,000
11	Norway	1	1,642,425,000	7,871,059,000	4,327,634,000	17,291,741,000
14	Poland	1	20,953,000	118,350,000	1,512,899,000	9,946,058,000
16	Sweden	1	6,856,601,000	12,347,841,000	16,203,966,000	46,275,655,000
18	India	1	0	3,263,302,000		35,595,219,000
19	South Korea	1	722,087,000	4,094,907,000	1,077,660,000	15,129,399,000
8	Ireland	1	7,324,024,000	22,016,241,000	31,973,799,000	46,014,091,000
12	Canada	1	14,051,681,000	23,475,890,000	17,442,390,000	54,863,344,000
4	Netherlands (**, yellow)	2	63,685,480,000	227,397,533,000	55,961,752,000	70,321,934,000
7	Swizerland	2	15,661,870,000	54,240,556,000	5,638,592,000	13,307,877,000
15	Japan	2	19,004,745,000	65,660,535,000	2,683,104,000	15,429,701,000
1	Germany (***, blue)	3	60,824,533,000	102,847,657,000	30,173,182,000	74,928,752,000
2	United States	3	200,825,564,000	425,237,568,000	211,699,000,000	486,833,000,000
5	France	3	59,950,937,000	123,789,280,000	63,363,473,000	115,484,484,000
6	Belgium	3	2,844,829,000	50,912,557,000		32,358,296,000
10	Spain	3	3,711,978,000	66,201,788,000	46,940,839,000	61,885,159,000
13	Hong Kong	3		16,613,173,000	6,424,724,000	16,734,404,000
17	Turkey				2,150,000,000	12,876,000,000
20	United Arab Emirates					

Note: *If outward stock is at least double the inward stock, US is labeled as main FDI source country. **If FDI Inward stock is at least twice as large as outward FDI stock, the US is labeled an FDI host country for the respective countries ***Two-way FDI. Source: UNCTAD

A Schumpeterian Dunning Mundell Fleming Model

One may consider a simple macro model – considering innovation aspects and FDI - with asymmetric outward FDI where $C=c(1-\tau)Z$ and the trade balance is stated as above. The current account additionally will take into account repatriation of profits from abroad. Country 2 is assumed to be characterizd by full employment and $Y^*(K^*, L^*, (1+\alpha'^*\alpha)A^*)$; α'^* is a positive parameter where the positive effect of α on foreign knowledge is linked to the knowledge production function abroad and international technology transfer, respectively. It should be noted that the simple macro model setting with equilibrium conditions for the goods market, the money market and the foreign exchange market corresponds to a small open economy with trade and FDI, however, implicitly heterogeneous firms are considered and even in a small open economy innovative Schumpeterian firms in particular have an impact on the global technology level if there is outward FDI. As regards the money market equilibrium, the equation is $M= P(1+\alpha''\alpha)m(Y, r)$ where zero expected inflation is assumed; m denotes the real demand for money. Note that the term $\alpha''\alpha$ - assuming a positive parameter α'' - implicitly indicates potential import competition effects and price level dampening that comes through the international technology transfer effect associated with α. If, however, α and outward FDI respectively would stand for horizontal FDI and hence a rising global market power of country 1 firms – and thus increased mark-up factors in goods markets in both countries - α'' would be negative. The foreign exchange market equilibrium condition reads $V(r-r^*) + V''q^* = q^*jZq^{*-\eta} - xZ^*q^{*\eta^*} + v'^*\alpha\beta^*Y^*q^*$ where v'^* is the share of foreign profits repatriated. The goods market equilibrium condition reads (with τ for income tax rate) for the simple framework without capital depreciation: $Y = c(1-\tau)Z + b(\beta Y/K–r) + G + xZ^*q^{*\eta^*} - q^*jZq^{*-\eta}$. One thus can consider multipliers for G, M and α which gives a better understanding of FDI globalization effects and the new aspects related to fiscal and monetary policy. It should be noted, of course, that Y^* has to be considerd here as a positive function of α. The model considered thus has Y^* and Z^*, respectively, as quasi-exogenous variables. Whether or not α is a policy variable could be discussed; if country 1 has government owned companies – thinking, for example, of the case of France, Germany or Italy – it would be obvious that α could be considered as a policy variable. Alternatively, one may assume that a rise of α reflects relatively improved locational conditions abroad for foreign subsidiaries or that technological developments have reduced the cost of firm-internal transactions costs in multinational companies.

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