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Optimal Inward Foreign Direct Investment Share within an International M&A Setting

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Summary:

Cumulated inward foreign direct investment has two major macroeconomic effects: (i) on the one hand, there is a positive international technology transfer effect on real GDP (ii) on the other hand, real national income is reduced by profit remittances to the source country. This naturally leads to the question of an optimal FDI share in the total capital stock, namely for maximizing real national income. The analysis presented herein derives new results for the rather simple case of asymmetric inward foreign direct investment and the setting of international mergers & acquisitions. Moreover, an enhanced neoclassical growth model also shows new results for the golden age – the approach assumes that the output elasticity can change and that the FDI inward intensity will affect the output elasticity of capital; empirical evidence for OECD countries is presented. From this transparent analytical framework, clear results for optimal inward FDI are obtained and the implications are indeed relevant in a modern macroeconomic research perspective which includes FDI analysis in open economies. There are crucial economic policy implications for policy makers as well international organizations; the approach also can be integrated into DSGE models.

Zusammenfassung:

Kumulierte ausländische Direktinvestitionen aus dem Ausland haben zwei wichtige makroökonomische Auswirkungen: (i) auf der einen Seite gibt es einen positiven internationalen Technologietransfereffekt, (ii) auf der anderen Seite wird das reale Nationaleinkommen durch Gewinnüberweisungen in das Herkunftsland verringert. Dies führt natürlich zu der Frage eines optimalen Anteils der ausländischen Direktinvestitionen am Gesamtkapitalstock, nämlich zur Maximierung des realen Nationaleinkommens. Die hier vorgestellte Analyse leitet klare Ergebnisse für den recht einfachen Fall asymmetrischer ausländischer Direktinvestitionen aus dem Ausland und für den Rahmen internationaler Fusionen und Übernahmen ab. Darüber hinaus wird auch ein erweitertes neoklassisches Wachstumsmodell betrachtet, um eine optimale Direktinvestitionsquote im Kontext Golden Age-Bedingung herzuleiten. Aus diesem transparenten analytischen Rahmen werden klare Ergebnisse für optimale ausländische Direktinvestitionen im Inland erzielt, und die Implikationen sind in der Tat relevant für eine moderne makroökonomische Forschungsperspektive, die die Analyse der ausländischen Direktinvestitionen in offenen Volkswirtschaften einschließt. Es gibt entscheidende wirtschaftspolitische Implikationen für politische Entscheidungsträger wie auch für internationale Organisationen; zudem kann der Analyseansatz in DSGE-Modelle eingebaut werden.

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1. Introduction

Countries with high inward cumulated foreign direct investment (FDI) stocks see the subsidiaries or foreign multinational enterprises (MNE) play a considerable role in production; often also in R&D and in trade. As regards real national income Z, a high share α* of foreign investment direct investment - α* will be dubbed inward FDI intensity – in the capital stock K of the host country implies, at first glance, a negative effect on Z since net factor income sent abroad will be α*ßY (with ß denoting the ratio of profits to gross domestic product). However, one also has to consider that – with K denoting the capital stock, A knowledge and L labor input) the macroeconomic production function F(K, A, L) will be influenced by cumulated foreign direct investment; FDI brings an international technology transfer which typically should be a positive function of α* as well as a positive function of the share of skilled labor in the total workforce – skilled workers are indeed required by the subsidiaries of MNEs in most sectors. Inward FDI inflows could be in the form of greenfield investment as well as international mergers & acquisitions (M&A).

It is obvious that North-South FDI outflows should generate technology transfers for host countries, but within the OECD countries cumulated inward FDI flows also contribute to host countries' total factor productivity growth and an improvement of the technological basis of the respective firm taken over (see the survey of SAGGI, 2002). As regards the latter effect, empirical evidence for the UK manufacturing industry, for example, has been provided by GIRMA (2005) who focused only on international FDI acquisition cases – the author shows that it is only up to a certain critical international knowledge gap for firms taken over for foreign investors that there is a significant international technology transfer effect. The Girma paper suggests that too broad an international knowledge gap between the acquiring firm and the M&A target firm in the UK manufacturing industry – when British firms are close to the national production frontier – generates no international technology spillovers and, in this perspective, the Girma paper is a contribution to the broader debate about the role of relative factor endowment in the source country and the host country emphasized by CARR ET AL. (2001) and the critical response of BLONINGEN ET AL. (2004).

In order to keep the theoretical analysis presented herein relatively simple, the subsequent approach focuses only on the technology transfer effect, related to process innovations, associated with international M&As, but this perspective is nevertheless already quite interesting. The share of brownfield investment in many countries has indeed accounted for 50% (or above) of all foreign investment inflows (CALDERON/LOAYZA/SERVEN, 2004).

If one takes a look at the outward FDI stocks of OECD countries relative to the source country's capital stock, the US is among the leading economies: the ratio of US subsidiaries' outward capital stock relative to the US capital stock reached 12.9 percent in 2017 (see Table 1; for the complete annual data from 1980 to 2017 see complete tables in the appendix). Several EU countries were ahead of the US, but the leaders here, namely Luxembourg, Ireland, the Netherlands and Belgium, partly represent particularly attractive conditions for "intermediate" inward FDI flows into holding companies which in turn are often the basis of the high FDI outflows of these countries. With two Scandinavian countries, namely Denmark and Sweden, among the leading outward FDI stock countries, tax considerations on the host country side are

apparently less of a factor than is the case in relation to the previous group of small EU countries.

Table 1: Outward FDI Stock/Source Country Capital Stock (selected EU Countries, ø EU Core and USA), 1990-2017, sorted by descending order for 2017

Country	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017
LUX				0,620	1,225	0,988	0,624	0,831	0,918	0,891	0,970	1,212
IRL	0,094	0,071	0,095	0,228	0,380	0,362	0,426	0,515	0,593	0,812	0,691	0,760
NLD	0,092	0,109	0,187	0,309	0,286	0,288	0,280	0,282	0,526	0,442	0,537	0,608
BEL	0,050	0,078	0,159	0,334	0,184	0,183	0,190	0,215	0,208	0,210	0,205	0,238
SWE	0,061	0,069	0,116	0,200	0,232	0,229	0,218	0,214	0,192	0,165	0,159	0,167
DNK	0,016	0,043	0,117	0,112	0,140	0,139	0,145	0,145	0,126	0,121	0,118	0,134
UK	0,065	0,066	0,187	0,194	0,168	0,180	0.158	0,147	0,136	0,120	0,121	0,134
USA	0,027	0,044	0,072	0,076	0,093	0,087	0,099	0,116	0,112	0,105	0,108	0,129
FIN	0,019	0,025	0,091	0,120	0,140	0,131	0,139	0,134	0,108	0,088	0,098	0,111
FRA	0,027	0,073	0,069	0,086	0,105	0,107	0,107	0,104	0,096	0,092	0,090	0,096
AUT	0,007	0,012	0,026	0,066	0,112	0,111	0,107	0,113	0,100	0,088	0,080	0,092
EU Core (ø)	0,036	0,064	0,060	079	0,100	0,102	0,103	0,097	0,087	0,084	0,082	0,091
DEU	0,044	0,056	0,051	0,073	0,096	0,097	0,100	0,091	0,079	0,075	0,074	0,087
ESP	0,007	0,012	0,039	0,066	0,078	0,078	0,064	0,066	0,056	0,054	0,053	0,058
EST		0,001	0,005	0,025	0,040	0,031	0,038	0,041	0,036	0,035	0,036	0,042
ITA	0,012	0,016	0,024	0,030	0,044	0,042	0,037	0,037	0,032	0,029	0,027	0,033
PRT	0,001	0,004	0,020	0,041	0,036	0,036	0,032	0,036	0,027	0,027	0,025	0,029
HUN	0,000	0,001	0,003	0,016	0,023	0,026	0,034	0,032	0,032	0,027	0,018	0,021
SVN		0,003	0,004	0,013	0,027	0,025	0,021	0,018	0,016	0,014	0,014	0,016
CZE		0,000	0,001	0,003	0,009	0,007	0,009	0,010	0,009	0,009	0,009	0,014
LTU		0,000	0,000	0,005	0,011	0,013	0,014	0,014	0,012	0,012	0,011	0,013
POL	0,000	0,001	0,000	0,001	0,009	0,010	0,013	0,015	0,013	0,011	0,011	0,011
GRE	0,004	0,002	0,005	0,010	0,023	0,027	0,021	0,015	0,012	0,010	0,008	0,008
SVK		0,000	0,002	0,002	0,008	0,008	0,009	0,009	0,004	0,004	0,004	0,007
LVA		0,003	0,000	0,002	0,004	0,003	0,004	0,005	0,004	0,004	0,004	0,005

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 5-year intervals from 1990-2010, annual data thereafter.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

Inward FDI stock figures relative to the host country capital stock show once again that the US is among the leading OECD countries – with a ratio of 12.9 percent in 2017 (see Table 2). However, here the increase over time was much slower than the rise of figures for relative US outward FDI stock figures. Ahead of the US were the corporate tax haven countries in the EU, namely, Luxembourg, Ireland, Netherlands and Belgium plus Sweden, UK and Estonia as three other countries; France and Germany achieved a medium ranking and Italy was in a rather weak position in 2017. Besides Estonia in Eastern Europe, Poland held a rather favorable rank in 2017, closely following the US which is a much older host economy for cumulated inward FDI flows.

It is remarkable that the US inward FDI stock figure – relative to the US capital stock – has gradually declined over a rather long period, namely between 1999 to 2008, only thereafter did the ratio increase again. As here a particular interest is on international technology transfer through inward FDI, it is noteworthy indeed that several EU accession countries in Eastern Europe, apparently eager to catch up with Western Europe after officially gaining EU membership, had achieved rather high FDI inflows by 2017.

Table 2: Inward FDI Stock/Host Country Capital Stock (Selected EU Countries, ø EU Core and USA), 1990-2017, sorted by descending order for 2017

Country	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016	2017
LUX				0,660	1,128	1,329	0,855	0,919	1,156	0,926	0,928	0,859
IRL	0,239	0,187	0,430	0,358	0,319	0,318	0,396	0,399	0,412	0,794	0,678	0,815
NLD	0,060	0,073	0,150	0,232	0,174	0,177	0,184	0,191	0,371	0,305	0,343	0,407
BEL	0,072	0,109	0,173	0,264	0,201	0,203	0,211	0,228	0,200	0,191	0,178	0,199
SWE	0,015	0,029	0,088	0,160	0,208	0,206	0,205	0,193	0,154	0,147	0,142	0,159
UK	0,058	0,043	0,087	0,123	0,107	0,121	0,134	0,124	0,128	0,114	0,113	0,137
EST		0,013	0,052	0,146	0,111	0,106	0,120	0,133	0,121	0,110	0,112	0,129
USA	0,020	0,033	0,074	0,059	0,067	0,067	0,074	0,091	0,097	0,099	0,111	0,129
POL	0,000	0,009	0,030	0,062	0,105	0,088	0,101	0,111	0,095	0,078	0,075	0,090
SVK		0,004	0,028	0,092	0,109	0,108	0,106	0,105	0,079	0,072	0,072	0,086
FIN	0,009	0,014	0,042	0,080	0,088	0,088	0,089	0,082	0,086	0,076	0,072	0,082
DNK	0,020	0,041	0,118	0,094	0,082	0,078	0,078	0,072	0,072	0,068	0,069	0,078
AUT	0,016	0,020	0,032	0,075	0,099	0,088	0,084	0,087	0,081	0,068	0,061	0,078
PRT	0,017	0,023	0,035	0,057	0,061	0,057	0,059	0,068	0,058	0,057	0,053	0,069
CZE		0,006	0,018	0,043	0,074	0,065	0,070	0,067	0,058	0,056	0,055	0,068
ESP	0,031	0,036	0,048	0,083	0,075	0,074	0,067	0,074	0,064	0,059	0,058	0,067
HUN	0,002	0,028	0,052	0,101	0,088	0,080	0,090	0,088	0,080	0,065	0,058	0,066
LTU		0,004	0,022	0,061	0,063	0,065	0,066	0,068	0,057	0,052	0,050	0,060
FRA	0,024	0,045	0,035	0,052	0,056	0,060	0,057	0,060	0,052	0,050	0,049	0,054
EU Core (ø)	**0,028**	**0,040**	**0,042**	**0,055**	**0,062**	**0,064**	**0,063**	**0,059**	**0,050**	**0,046**	**0,046**	**0,052**
DEU	0,032	0,034	0,050	0,059	0,067	0,067	0,069	0,058	0,048	0,043	0,043	0,051
LVA		0,007	0,019	0,033	0,046	0,043	0,043	0,048	0,041	0,042	0,037	0,044
SVN		0,012	0,013	0,029	0,036	0,037	0,034	0,031	0,031	0,030	0,031	0,037
ITA	0,012	0,010	0,018	0,029	0,029	0,029	0,026	0,025	0,024	0,022	0,021	0,026
GRE	0,007	0,009	0,012	0,021	0,019	0,017	0,012	0,011	0,009	0,010	0,010	0,014

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 5-year intervals from 1990-2010, annual data thereafter.

Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

It is remarkable that between 2007 and 2017 the net outward FDI-stock ratio of the US fell from 3.3 percent of the US capital stock to 0; and for the UK the decline from 9.7 percent of the UK capital stock to -0.02 percent is even more pronounced (see appendix Tab. 9; and for previous periods see Tab. 8). A detailed decomposition analysis cannot be conducted here.

Considering the role of FDI for economic catching-up, it would certainly be naïve to consider only inward FDI. In advanced OECD countries, an important role is played by both inward FDI and outward FDI. Among the bigger European Union (EU) member states, Italy is a country which faces the problem of having a rather small number of MNEs of Italian origin – it is, for example, something of a paradox that Italy is home to thousands of excellent hotels but not a single Italian multinational hotel company is well-known, while there are several from France, Spain and Germany. It has long been known that Asian Newly Industrializing Countries (NICs) have undertaken many efforts to generate domestic multinational companies in an often very competitive market environment combined with government subsidies for R&D and sometimes for outward FDI. As regards the latter aspect, many Chinese firms – state-owned enterprises as well as private firms - have obtained some form of government subsidy or funding for state-owned special financial entities. Asset-seeking outward FDI has been important for intra-OECD foreign direct investment so that, for example, since the 1990s leading pharmaceutical companies from France, Germany, Switzerland and the UK would invest in US biotech firms which were considered as a crucial asset for upgrading the technology and knowledge portfolio of the respective firm. Nevertheless, in the interest of rigor as well as relevance, the subsequent analysis places a focus only on inward brownfield FDI. From this transparent analytical framework, clear results for optimal inward FDI are obtained. The next section develops the optimization framework for inward FDI intensity in a simple setting, while the subsequent section considers an enhanced neoclassical model in the context of new insights for the golden age. The final section offers key policy conclusions.

2. Optimization of Inward FDI Intensity

In a rather compact approach, the optimal share of inward FDI intensity can be derived in a simple framework. Initially, one has to consider the definition of real income for the case of asymmetric inward (cumulated) FDI. Hence equation 1) is fundamental for the analysis. A second analytical element is the production function in combination with an international technology transfer function t".

1) $Z = Y(1 - \alpha * \beta)$; the definition of real gross national income Z (whereby ß is share of profits in Y)

2) $Y = F(K, A, L)$ is a standard production function.

Subsequently, a Cobb-Douglas production function (with 0<ß<1) will be used. The international technology transfer effect – referring to process innovations - is covered by t"

which is assumed to be a positive function of α*, H" and A* (H" is share of higher skilled workers in the total workforce). It is assumed that a higher share of highly skilled workers will reinforce international technology transfers. It seems natural to assume that the inward FDI intensity itself will contribute to international technology transfer unless the host country imposes strong restrictions on majority ownership (as is the case in, for example, India and used to be the case for part of China's economy until about 2019).

3) $t" = \left(1 + f(\alpha^*, H")A^*\right)$, where * stands for foreign variables; f(…)A* is the international technology transfer effect.

International technology transfer is governed by the subsequent term: $\left(1+\alpha'\left(\alpha^*, H"\right)\alpha^* A^*\right)A$ where α' is the pure international technology transfer parameter which gives the following effective production function:

2.1) $Y = K^{\beta}\left(\left(1+\alpha'\left(\alpha^*, H"\right)\alpha^* A^*\right)(AL)\right)^{1-\beta}; \alpha' > 0$ and $\frac{\partial \alpha'}{\partial \alpha^*} < 0$

Taking logs gives:

2.2) $lnY = \beta lnK + (1-\beta)\alpha'\left(\alpha^*, H"\right)\alpha^* A^* + (1-\beta)(lnA + lnL)$

2.3) $Z = K^{\beta}\left(\left(1+\alpha'\left(\alpha^*, H"\right)\alpha^* A^*\right)(AL)\right)^{1-\beta}\left(1 - \alpha^*\beta\right)$

Foreign ownership has a positive effect on Y through the international technology transfer effect and a negative effect on Z through the term α*ß – the term relevant for net factor income from abroad in the Systems of National Account – so that the question of an optimal foreign investment share α* arises. For the sake of simplicity, it is assumed that α'(α*, H")α*A* as well as α*ß are close to zero, so that the approximation ln(1+x) = x (for x close to zero) can be used. Taking logs, one obtains:

2.4) $lnZ = \beta lnK + (1-\beta)\left(\alpha'\left(\alpha^*, H"\right)\alpha^* A^*\right) + (1-\beta)(lnA + lnL) - \alpha^*\beta$

Maximizing lnZ with respect to α* requires as a necessary condition:

2.5) $\frac{\partial lnZ}{\partial \alpha^*} = \alpha'(\alpha^*)A^* + \frac{\partial a'}{\partial \alpha^*}\alpha^* A^* - \frac{\beta}{(1-\beta)} = 0$

With the assumption α'= α''-b''α*, we get (assuming that parameters α">0, b">0; largely in line with the empirical findings of GIRMA, 2005):

2.6) $\frac{\partial \ln Z}{\partial \alpha^*} = (\alpha" - b"\alpha^*)A^* - b"\alpha^* A^* - \frac{\beta}{(1-\beta)}$; *for optimum*: $\frac{\partial \ln Z}{\partial \alpha^*}(\alpha^{*opt}) = 0 \rightarrow$

2.7) $(\alpha" - b"\alpha^{*opt})A^* - b"\alpha^{*opt} A^* - \frac{\beta}{(1-\beta)} = 0$

2.8) $$\alpha^{*opt} = \frac{\left(A^{*}\alpha'' - \frac{\beta}{(1-\beta)} \right)}{(2b''A^{*})}$$

Equation 2.8) on the RHS can be rewritten as $$\frac{\left(a'' - \frac{\left(\frac{\beta}{(1-\beta)} \right)}{A^{*}} \right)}{2b''}$$. The optimum foreign ownership share α^{*opt} in K thus is a positive function of the technology transfer parameter α" as well as of A* and a negative function of ß. For a positive α^{*opt}, A* α" must exceed ß/(1-ß). For a small open economy this condition is always fulfilled since the knowledge in the rest of the world (A*) is very large. To the extent that the technology transfer parameter can be raised by raising the share of higher education (H") in the workforce, government fiscal policy – with a focus on education – could be useful.

The sufficient condition for a maximum is a negative second derivative so that one has to consider.

$$\frac{\partial^2 \ln Z}{\partial \alpha^{*2}}(\alpha^{*opt}) = -2b''A^{*} < 0, \; if \;\; b'' < 0 \; and \;\; A^{*} < 0 \; or \; both > 0$$

The standard case in reality will, of course, indeed be A*>0 and b">0. Hence the optimum α* identified maximizes Z.

3. Enhanced Growth Model with New Insights for the Golden Age

Analytically, one can extend the approach presented herein to a fully-fledged Schumpeterian growth model with trade and FDI. With gradually rising global foreign direct investment, such a framework is indeed useful for analyzing many macroeconomic issues in a new light - relevant not only for OECD countries but for NICs as well. A standard neo-classical golden rule with a macro production function $Y=K^{ß}(AL)^{1-ß}$, a savings function S= s(1- τ)Y and a capital depreciation rate δ, an exogenous growth rate of labor, namely n and an exogenous growth rate of knowledge, namely a, gives the following differential equation for k':=K/(AL):

(I) $$\frac{dk'}{dt} = s(1-\tau)k'^{\beta} - (a+n+\delta)k'$$

With # denoting the steady state, we get the following equation (assuming 0<ß<1):

(II) $$k'\# = \left(\frac{s(1-\tau)}{a+n+\delta} \right)^{\frac{1}{1-\beta}}$$

(III) $$y'\# = \left(\frac{s(1-\tau)}{a+n+\delta} \right)^{\frac{\beta}{1-\beta}}$$

The condition for maximizing per capita consumption C/(AL) in the steady state – actually C/(AL) is consumption per labor in efficiency units – is obtained from the equation (in the steady state) C/(AL) = y' – (a + n + δ)k' and d(C/(AL))/dk' = ßk'$^{ß-1}$ – (a+n+δ) = 0 - therefore:

(IV) $$k'\#^{gold} = \left(\frac{\beta}{a+n+\delta} \right)^{\frac{1}{1-\beta}}$$

In combination with (I) we get as the condition for consumption per capita maximization in the steady state:

(V) $$s(1-\tau) = \beta$$

Environmental Aspect of Missing the Maximum Per Capita Consumption

A golden capital intensity is crucial; while one might argue that both a k'# below k'# ^{gold} is as bad in terms of welfare losses as k'# above k' ^{gold}, it is indeed more reasonable to argue that one should avoid an excessive capital intensity k'# since one is not only missing the maximum per capita consumption; rather one should also notice that k'# exceeding k'# ^{gold} means that more machinery and equipment has been produced which amount to squandering of resources and energy (hence CO2 emissions will be unnecessarily high so that there is a climate problem on top).

The next two equations give the optimum income tax rate in the sense that tax policy can be used to bring about the maximum per capita consumption (actually, the maximum C/(AL) in the steady state).

(VI) $$1-\tau = \frac{\beta}{s}$$

(VII) $$\tau^{gold} = 1 - \left(\frac{\beta}{s} \right)$$

A positive tax rate requires that s>ß.

In the presence of asymmetric cumulated FDI – only inward FDI in country 1 – the uses side of household income reads:

(VIII) $Y(1-\alpha^{*}\beta) = C + S + T$

Foreign subsidiaries' investment from profits is assumed to be given by S'=s'(1-α*ß)Y, namely under the assumption that foreign profits are not taxed; S= S'' + S' where S'' is savings of private households, namely S''=s(1-τ)(1-α*)Y. Hence tax revenue T is equal to τ(1-α*ß)Y. As already emphasized in WELFENS (2011) there is indeed a need to integrate both FDI and trade into a growth model; moreover, the idea developed in WELFENS (2017) is subsequently picked up according to which the output elasticity of capital is affected by an R&D-related variable – here, the inward FDI-stock ratio α* is considered (with a positive parameter ß'; rather small in reality as one may assume):

(IX) $\beta = \beta_0 + \beta'\alpha^{*}$

Here, $ß_0$ is the output elasticity ruling under capital flow autarky – here defined as the absence of FDI inflows. To the extent that ß* (or generally the output elasticity of capital in source countries of FDI) differs from $ß_0$, the traditional Heckscher-Ohlin model assumption of identical technologies at home and abroad would not hold which is a condition relevant for trade-related dynamics after economic opening-up. Under profit maximization and competition in goods and factor markets, the above equation implies that the profit ratio in OECD countries – possibly also in NICs – is raised by the presence of foreign investors which seems to be a plausible assumption as long as foreign investors impose at least a modest risk premium for investment abroad (see, e.g., HUNG/MASCARO (2004) for the US case as a source country: moreover, it will be assumed that the growth rate of knowledge a is positively influence by the presence of foreign investors and thus (with a_0 representing a under capital flow autarky; parameter a'>0) determined as follows:

(X) $a = a_0 + a'\alpha^{*}$

Since the savings function is

(XI) $S = s(1-\tau)(1-\alpha^{*})Y + s'\alpha^{*}\beta Y = s(1-\tau)Y + \alpha^{*}\left(s' - s(1-\tau)\right)Y$,

We thus get for the steady state capital intensity k'#:

(XII) $k'^{\#} = \left(\frac{s(1-\tau)Y + \alpha^{*}(s' - s(1-\tau))Y}{a + n + \delta} \right)^{\frac{1}{1-\beta}}$

Setting d(C/(AL))#/dk'=0 for the golden age - maximizing C/(AL) -, the per capita consumption maximizing capital intensity is given by:

(XIII) $\beta_0 + \beta'\alpha^{*} = s(1-\tau) + \alpha^{*}(s' - s(1-\tau))$

In middle-income and high income countries with favorable conditions for foreign investors one may assume that s'>s(1-τ). Subsequently it will be assumed that $ß_0$ exceeds s(1-τ) so that a positive α* gold is obtained (a positive α * also is obtained if both the numerator and the denominator are negative in equation XV).

Therefore, we get as the optimal α*:

(XIV) $\beta_0 - s(1-\tau) = \alpha^*(s' - s(1-\tau) - \beta')$

(XV) $$\alpha^{*gold} = \frac{\beta_0 - s(1-\tau)}{s' - s(1-\tau) - \beta'} = \frac{\frac{\beta_0}{1-\tau} - s}{\frac{s'-\beta'}{1-\tau} - s}$$

Here it is assumed that (1-τ) exceeds s and that ß$_0$>s(1-τ); also ß$_0$ is assumed to exceed s'-ß' so that the FDI intensity is in the range between zero and unity. Hence α*^{gold} is a positive function of ß$_0$ and a positive function of s (if ß$_0$> s'- ß'); and alternatively if ß' (if ß'<s') as well as a negative function of s' and the income tax rate. The α*^{gold} brings about an optimum level of the growth path so that there is an economic relevance only if a = a$_0$ + a'α*; if one of the above variables would also affect the progress rate a there would be a new problem setting. Note for (XV) the condition for

(XVI) $$\frac{d\alpha^{gold}}{ds} = \frac{(\tau-1)(s' - \beta_0 - \beta')}{\left((\tau-1)s + s' - \beta'\right)^2} > 0, \text{ if } \beta_0+\beta'>s'$$

The presence of multinationals indeed could bring also more product innovations; then the mark-up rates in technology- and knowledge-intensive sectors will be raised in the source country and this should translate into a higher parameter ß'. There could also be a role for the import-GDP ratio (j): the higher j is, the lower the profit ratio, namely due to enhanced import competition (v" represents a positive parameter); a further interesting modification that could be considered is the hypothesis that ß'= α'α* - v"j + j"j' where j' is the share of intermediate imports in GDP and j" a positive parameter; such an hypothesis gives a simultaneous analysis of the role of trade – here intermediate imports – plus FDI, innovation and long run growth, respectively.

The implication would be that a higher intermediate import ratio j' raises the optimal α* in the golden age which indeed could reflect the typical dynamics observed in Germany or the US (BAILEY/LAWRENCE 2005) with reference to US software sector), namely that increased international outsourcing - possibly also off-shoring - allows high-tech firms to move up the technology ladder which should raise the profit ratio in the respective sector as the mark ups observed increase. The 1990s and the first decade of the 21st century were a period of enhanced innovation dynamics in OECD countries and indeed mark ups have increased – on the latter see e.g. FURMAN (2015) and FURMAN/ORSZAG (2018).

The new approach developed here is compatible with the ideas presented in the previous section, although the first approach was simply maximizing real national income while the growth model in the golden age puts a focus on maximizing per capita consumption. In a basic sense, the growth model is a more general analysis and lends itself easily to empirical analysis: One can analyze the impact of FDI inward intensity on the aggregate profit ratio in the economy of OECD countries (in a separate regression analysis Luxembourg is excluded as an outlier in the context of heavy tax avoidance-related FDI dynamics).

The regression results, based on a Random Effects (RE) panel data analysis, indeed show a positive impact of the current (or lagged) FDI inward intensity on the profit ratio for the whole

sample and for the period 2008-2018; for the latter period in addition the import of goods and services relative to GDP additionally is a highly significant variable. Thus there is empirical evidence that the output elasticity of capital – under competition this elasticity will be equal to the profit ratio - is raised through a stronger presence of multinational companies which is in line with the enhanced growth model developed here. From a theoretical perspective – and considering reality – there is no need to assume that output elasticity in the production function of firms and in the aggregate production, respectively, is constant.

As regards the impact of the lagged FDI inward intensity there is a certain caveat as one cannot exclude that this reflects market concentration effects in the context of cumulated FDI inflows. At least in the context of the EU28 countries, this is not likely to be the case for the tradables sector after 1993, i.e. since the EU single market was created; one may assume that FDI inflows in the non-tradables sector have not dominated the effects at the aggregate level.

Table 3: Regression for the Profit Ratio of OECD Countries 1995-2018 (Luxembourg excluded, see iso3 list of countries/id is 32; G&S is goods and services)

Note the sample periods for (1) is 1995-2018; (2) 1995-2009; (3) 2008-2018

	(1) Full sample	(2) Pre-2009	(3) Post-2008	(4) Full sample	(5) Pre-2009	(6) Post-2008
VARIABLES	RE	RE	RE	RE	RE	RE
Inward FDI stock to capital stock	0.174***	0.052	0.239***			
	(0.044)	(0.051)	(0.063)			
Lag1 Inward FDI stock to capital stock				0.160***	0.066***	0.195***
				(0.033)	(0.021)	(0.054)
Imports of G&S to GDP	0.050	-0.013	0.115***	0.061	-0.008	0.123***
	(0.038)	(0.055)	(0.039)	(0.045)	(0.056)	(0.042)
Constant	41.651***	44.033***	36.098***	41.006***	43.582***	36.259***
	(1.916)	(2.170)	(2.704)	(2.163)	(2.321)	(2.765)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sq overall	0.002	0.005	0.004	0.001	0.007	0.004
Observations	677	422	255	650	395	255
Number of id	32	32	32	32	32	32

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Hausman test: Random effects (RE) approach use here is more efficient than fixed effects approach

Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
ISO3	768	20	10.672	1	37
Year	768	2006.5	6.927	1995	2018
Profit ratio	705	44.057	7.898	26.52	70.222
Inward FDI to capital stock	733	8.428	8.773	.157	81.466
Imports of G&S to GDP	704	41.373	18.904	7.708	105.226

Pairwise correlations

Variables	(1)	(2)	(3)
(1) Profit ratio	1.000		
(2) Inward FDI to capital stock	-0.042	1.000	
(3) Imports of G&S to GDP	0.012	0.430*	1.000

* shows significance at the 0.05 level

Source: Own calculations; profits and GDP data from OECD; FDI stock data from UNCTAD; capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

4. Policy Implications and Future Research

The economic logic of international M&As might at first sight not leave much room for policy intervention. However, there are several aspects to be considered when one analyzes these aspects more closely, including potential intra-industry and inter-industry knowledge spillovers in the host country plus the potentially relevant role of government with supply-side fiscal policy which could include investment in infrastructure or government support for training/retraining and education expenditures.

From a policy perspective, one could consider tax incentives for attracting technology-oriented FDI inflows. Several authors have considered aspects of government policies eager to attract inward foreign direct investment (see, e.g., ROSENBOIM ET AL., 2008), however, the optimization aspect developed here has not been considered. The optimal inward FDI ratio could, of course, also be derived in a broader FDI inflow perspective where both the international technology transfer aspect and extra capital accumulation effects – related to the presence of foreign subsidiaries (partly with greenfield investment) - are taken into account. As regards FDI inflow dynamics in Eastern European countries in a post-socialism perspective,

MNEs have certainly played a critical role with regard to economic catching up (KLEIN/WELFENS, 2012), but it remains unclear whether these EU accession countries or more traditional peripheral EU cohesion countries, such as Ireland, Portugal, Spain and Greece, had governments with an explicit optimization approach balancing the positive technology transfer effect and the negative international profit transfer effect on real national income. A similar question may be raised with respect to Latin American countries, Asian Newly Industrialized Countries as well as countries in Africa. Aspects of FDI inward optimization emphasized here could, in principle, also be studied in DSGE models and here FDI inward dynamics and innovation dynamics could be linked. It should be noted that empirical evidence for EU countries suggests that relative FDI inward stocks contribute to both higher process innovations and higher product innovations (WELFENS, 2020); a specific empirical focus on international M&As and FDI inflow dynamics and innovation performance could be analyzed – possibly with some reservations to the extent that international M&A-based inflows are often followed by a wave of rising greenfield investment. It is not trivial to analyze the linkages between FDI stocks and innovation dynamics if one wants to make a distinction between product and process innovations. JUNGMITTAG/WELFENS (2020) present empirical evidence for EU countries that inward FDI contributes to higher patent applications – without making a distinction between process and product innovations which is technically quite difficult.

A more comprehensive analysis with endogenous R&D could also be considered in future research. As regards EU countries, one may point out that in the 1990s Ireland channeled EU funding into human capital formation and the training of workers so that the share of skilled workers in the workforce has increased – making Ireland more attractive for foreign investors. Ireland's economic miracle in the period 1980 to 2000 relied on an intelligent policy mix which combined various elements of consistent economic policy with a twin focus on raising inward investment while encouraging a pro-innovative business community in various ways (BARRY, 1999).

With high inward FDI stocks, countries can effectively slow down international capital mobility which could be useful for reinforcing economic stability as sudden capital outflows would become a smaller risk than in an economy with rather modest FDI inflows. It also is noteworthy that CALDERON/LOAYZA/SERVEN (2004) found that a wave of international M&As is often followed by a rise of greenfield investment so that in a more long run and more comprehensive analytical framework both brownfield and greenfield investment should be considered.

As regards the catching-up economies in Eastern Europe, Asia, Latin American and Africa, one may raise the question of the extent to which these countries have achieved an optimum inward FDI intensity; those countries with a large gap here could try to get policy suggestions from independent experts or competent international organizations, such as the World Bank and regional development banks. Thus far, optimum innovation policy and optimum inward FDI is a topic not much considered by the World Bank and the EBRD.

Finally, one should not overlook that small open economies might face serious problems with rising mark-ups of foreign subsidiaries once they attract higher FDI inflows – market power in many countries could be a serious challenge. Focusing on attracting higher FDI inflows is usually much less problematic in terms of competition intensity if several countries create a

regional trade integration framework such as ASEAN, Mercosur or the various African integration clubs. At the bottom line, there is little doubt that regional integration reinforces inward FDI as was shown – with a focus on BREXIT – by WELFENS/BAIER (2018). In this context, one may argue that policy studies are often too little concerned with the distinction between gross domestic product and gross national income although such a distinction is crucial for, as an example, economic welfare aspects; this holds, of course, despite the fact that part of outward FDI flows is not adequately covered in official statistics as the example of Spain has shown (MARTINEZ-TOLEDANO, 2017). Ultimately, one may state with some confidence that trade analysis is much better anchored in the field of Economics than foreign direct investment. Hence, many crucial analytical challenges remain on the agenda.

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Appendix: FDI and Capital Stock Data for Selected EU Countries and US, Annual Data 1980-2017

Table 4: Outward FDI / Source Country Capital Stock (Selected EU Countries, ø EU Core and USA), Annual Data for 1980-1999, sorted by descending order for 2017

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2017
LUX																					1,212
IRL						0,102	0,099	0,095	0,096	0,100	0,094	0,088	0,083	0,077	0,073	0,071	0,070	0,071	0,077	0,087	0,760
NLD	0,051	0,047	0,045	0,046	0,047	0,056	0,060	0,071	0,070	0,079	0,092	0,096	0,091	0,084	0,095	0,109	0,125	0,129	0,144	0,163	0,608
BEL	0,008	0,008	0,007	0,009	0,009	0,014	0,022	0,028	0,034	0,045	0,050	0,057	0,063	0,067	0,070	0,078	0,083	0,090	0,126	0,136	0,238
SWE	0,006	0,007	0,009	0,010	0,011	0,016	0,024	0,034	0,038	0,049	0,061	0,063	0,054	0,048	0,060	0,069	0,067	0,073	0,087	0,099	0,167
DNK	0,005	0,005	0,003	0,004	0,004	0,005	0,006	0,007	0,009	0,013	0,016	0,032	0,033	0,030	0,036	0,043	0,047	0,047	0,064	0,083	0,134
UK	0,028	0,030	0,029	0,029	0,030	0,034	0,039	0,048	0,056	0,057	0,065	0,064	0,058	0,061	0,064	0,066	0,067	0,072	0,097	0,137	0,134
USA	0,010	0,010	0,010	0,012	0,012	0,016	0,021	0,023	0,026	0,031	0,027	0,030	0,029	0,037	0,038	0,044	0,051	0,057	0,066	0,079	0,129
FIN	0,002	0,001	0,001	0,002	0,003	0,004	0,005	0,010	0,011	0,014	0,019	0,020	0,018	0,018	0,022	0,025	0,031	0,037	0,052	0,060	0,111
FRA	0,006	0,007	0,008	0,009	0,010	0,010	0,011	0,013	0,013	0,018	0,027	0,031	0,034	0,033	0,037	0,073	0,085	0,098	0,124	0,154	0,096
AUT	0,001	0,002	0,002	0,002	0,001	0,002	0,002	0,002	0,002	0,004	0,007	0,008	0,008	0,009	0,011	0,012	0,014	0,015	0,018	0,020	0,092
EU Core (ø)	0,007	0,007	0,008	0,008	0,009	0,010	0,012	0,015	0,015	0,018	0,036	0,039	0,040	0,038	0,043	0,064	0,073	0,082	0,101	0,099	0,092
DEU	0,007	0,008	0,008	0,008	0,008	0,011	0,013	0,016	0,017	0,018	0,044	0,048	0,045	0,044	0,050	0,056	0,061	0,066	0,078	0,044	0,087
ESP	0,001	0,001	0,002	0,002	0,002	0,003	0,004	0,005	0,005	0,006	0,007	0,009	0,008	0,009	0,010	0,012	0,014	0,017	0,020	0,030	0,058
EST													0,001	0,001	0,001	0,001	0,002	0,004	0,004	0,006	0,042
ITA	0,002	0,002	0,002	0,002	0,004	0,005	0,007	0,008	0,009	0,009	0,012	0,013	0,012	0,013	0,014	0,016	0,017	0,020	0,025	0,026	0,033
PRT	0,002	0,002	0,002	0,002	0,002	0,002	0,001	0,001	0,001	0,001	0,001	0,002	0,003	0,003	0,003	0,004	0,005	0,007	0,011	0,012	0,029
HUN											0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,002	0,002	0,002	0,021
SVN													0,004	0,004	0,003	0,003	0,003	0,003	0,004	0,004	0,016
CZE														0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,014
LTU															0,000	0,000	0,000	0,000	0,000	0,000	0,013
POL		0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,001	0,001	0,001	0,001	0,001	0,011
GRE							0,005	0,004	0,004	0,004	0,004	0,003	0,003	0,003	0,003	0,002	0,002	0,003	0,002	0,003	0,008
SVK														0,001	0,001	0,000	0,001	0,001	0,002	0,002	0,007
LVA													0,004	0,004	0,003	0,003	0,002	0,002	0,003	0,002	0,005

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 1980-1999 annual data.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

Table 5: Outward FDI / Source Country Capital Stock (Selected EU Countries, ø EU Core and USA), Annual Data for 2000-2017, sorted by descending order for 2017

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
LUX			0,282	0,431	0,530	0,620	0,571	0,903	1,149	1,161	1,225	0,988	0,624	0,831	0,918	0,891	0,970	1,212
IRL	0,095	0,127	0,171	0,203	0,256	0,228	0,195	0,193	0,208	0,373	0,380	0,362	0,426	0,515	0,593	0,812	0,691	0,760
NLD	0,187	0,203	0,237	0,315	0,335	0,309	0,332	0,329	0,310	0,328	0,286	0,288	0,280	0,282	0,526	0,442	0,537	0,608
BEL	0,159	0,157				0,334	0,373	0,358	0,180	0,203	0,184	0,183	0,190	0,215	0,208	0,210	0,205	0,238
SWE	0,116	0,116	0,141	0,180	0,206	0,200	0,214	0,236	0,212	0,232	0,232	0,229	0,218	0,214	0,192	0,165	0,159	0,167
DNK	0,117	0,121	0,135	0,153	0,114	0,112	0,117	0,134	0,132	0,142	0,140	0,139	0,145	0,145	0,126	0,121	0,118	0,134
UK	0,187	0,179	0,205	0,235	0,234	0,194	0,204	0,249	0,194	0,181	0,168	0,180	0,158	0,147	0,136	0,120	0,121	0,134
USA	0,072	0,059	0,050	0,065	0,076	0,076	0,088	0,101	0,059	0,083	0,093	0,087	0,099	0,116	0,112	0,105	0,108	0,129
FIN	0,091	0,091	0,115	0,133	0,137	0,120	0,125	0,144	0,125	0,133	0,140	0,131	0,139	0,134	0,108	0,088	0,098	0,111
FRA	0,069	0,076	0,083	0,100	0,096	0,086	0,094	0,105	0,091	0,107	0,105	0,107	0,107	0,104	0,096	0,092	0,090	0,096
AUT	0,026	0,030	0,046	0,058	0,068	0,066	0,085	0,114	0,103	0,109	0,112	0,111	0,107	0,113	0,100	0,088	0,080	0,092
EU Core (ø)	**0,060**	**0,067**	**0,075**	**0,088**	**0,087**	**0,079**	**0,088**	**0,100**	**0,088**	**0,101**	**0,100**	**0,102**	**0,103**	**0,097**	**0,087**	**0,084**	**0,082**	**0,091**
DEU	0,051	0,059	0,067	0,076	0,078	0,073	0,081	0,096	0,086	0,095	0,096	0,097	0,100	0,091	0,079	0,075	0,074	0,087
SPA	0,039	0,045	0,050	0,062	0,070	0,066	0,071	0,078	0,074	0,077	0,078	0,078	0,064	0,066	0,056	0,054	0,053	0,058
EST	0,005	0,008	0,013	0,018	0,022	0,025	0,036	0,055	0,052	0,047	0,040	0,031	0,038	0,041	0,036	0,035	0,036	0,042
ITA	0,024	0,024	0,025	0,029	0,031	0,030	0,033	0,041	0,040	0,040	0,044	0,042	0,037	0,037	0,032	0,029	0,027	0,033
PRT	0,020	0,023	0,027	0,039	0,046	0,041	0,043	0,048	0,042	0,042	0,036	0,036	0,032	0,036	0,027	0,027	0,025	0,029
HUN	0,003	0,004	0,006	0,009	0,014	0,016	0,021	0,026	0,023	0,023	0,023	0,026	0,034	0,032	0,032	0,027	0,018	0,021
SVN	0,004	0,005	0,009	0,013	0,014	0,013	0,017	0,029	0,031	0,032	0,027	0,025	0,021	0,018	0,016	0,014	0,014	0,016
CZE	0,001	0,001	0,001	0,002	0,003	0,003	0,003	0,005	0,007	0,008	0,009	0,007	0,009	0,010	0,009	0,009	0,009	0,014
LTU	0,000	0,000	0,001	0,001	0,003	0,005	0,007	0,008	0,010	0,014	0,011	0,013	0,014	0,014	0,012	0,012	0,011	0,013
POL	0,000	0,000	0,000	0,000	0,001	0,001	0,003	0,005	0,005	0,007	0,009	0,010	0,013	0,015	0,013	0,011	0,011	0,011
GRE	0,005	0,006	0,008	0,010	0,010	0,010	0,013	0,017	0,019	0,023	0,023	0,027	0,021	0,015	0,012	0,010	0,008	0,008
SVK	0,002	0,003	0,003	0,004	0,004	0,002	0,004	0,005	0,007	0,007	0,008	0,008	0,009	0,009	0,004	0,004	0,004	0,007
LVA	0,000	0,000	0,000	0,001	0,002	0,002	0,002	0,004	0,004	0,004	0,004	0,003	0,004	0,005	0,004	0,004	0,004	0,005

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 2000-2017 annual data.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

Table 6: Inward FDI / Capital Stock (Selected EU Countries, ø EU Core and USA), Annual Data for 1980-1999, sorted by descending order for 2017

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2017
LUX																					0,859
IRL	0,308	0,293	0,288	0,297	0,302	0,303	0,296	0,286	0,273	0,255	0,239	0,229	0,220	0,206	0,194	0,187	0,188	0,190	0,236	0,252	0,815
NLD	0,023	0,022	0,020	0,020	0,022	0,029	0,036	0,044	0,042	0,047	0,060	0,060	0,057	0,053	0,062	0,073	0,082	0,080	0,104	0,120	0,407
BEL	0,010	0,013	0,015	0,017	0,018	0,027	0,040	0,043	0,053	0,068	0,072	0,082	0,085	0,100	0,107	0,109	0,118	0,122	0,168	0,162	0,199
SWE	0,005	0,005	0,005	0,005	0,005	0,007	0,009	0,013	0,013	0,014	0,015	0,021	0,015	0,014	0,022	0,029	0,032	0,039	0,048	0,068	0,159
UK	0,022	0,020	0,018	0,019	0,016	0,022	0,025	0,035	0,039	0,044	0,058	0,057	0,046	0,045	0,044	0,043	0,046	0,051	0,067	0,077	0,137
EST													0,002	0,005	0,009	0,013	0,016	0,022	0,035	0,048	0,129
USA	0,004	0,005	0,006	0,007	0,007	0,009	0,011	0,012	0,015	0,020	0,020	0,024	0,025	0,027	0,026	0,033	0,039	0,050	0,064	0,078	0,129
POL											0,000	0,001	0,002	0,003	0,004	0,009	0,012	0,015	0,022	0,024	0,090
SVK														0,002	0,003	0,004	0,007	0,007	0,016	0,018	0,086
FIN	0,001	0,002	0,002	0,002	0,002	0,003	0,004	0,006	0,006	0,007	0,009	0,008	0,008	0,008	0,012	0,014	0,015	0,017	0,029	0,032	0,082
DNK	0,010	0,008	0,006	0,007	0,007	0,009	0,011	0,013	0,013	0,015	0,020	0,030	0,029	0,028	0,033	0,041	0,038	0,037	0,058	0,077	0,078
AUT	0,009	0,007	0,007	0,006	0,005	0,007	0,009	0,011	0,011	0,014	0,016	0,016	0,015	0,014	0,016	0,020	0,020	0,021	0,024	0,024	0,078
PRT	0,011	0,011	0,011	0,010	0,010	0,011	0,011	0,011	0,012	0,015	0,017	0,019	0,020	0,022	0,022	0,023	0,024	0,026	0,033	0,029	0,069
CZE														0,004	0,004	0,006	0,007	0,008	0,012	0,015	0,068
ESP	0,003	0,003	0,003	0,003	0,004	0,006	0,008	0,014	0,016	0,022	0,031	0,035	0,030	0,029	0,034	0,036	0,036	0,034	0,040	0,039	0,067
HUN											0,002	0,006	0,009	0,015	0,018	0,028	0,032	0,044	0,051	0,057	0,066
LTU													0,001	0,002	0,004	0,004	0,008	0,011	0,016	0,019	0,060
FRA	0,008	0,008	0,009	0,009	0,010	0,011	0,011	0,012	0,014	0,016	0,024	0,026	0,028	0,028	0,033	0,045	0,060	0,063	0,087	0,114	0,054
EU Core (ø)	0,007	0,007	0,007	0,007	0,008	0,009	0,010	0,011	0,012	0,014	0,028	0,030	0,029	0,028	0,032	0,040	0,047	0,049	0,065	0,070	0,052
DEU	0,006	0,006	0,005	0,005	0,005	0,007	0,008	0,011	0,010	0,013	0,032	0,034	0,030	0,027	0,031	0,034	0,034	0,034	0,043	0,025	0,051
LVA													0,002	0,002	0,005	0,007	0,010	0,014	0,016	0,018	0,044
SVN													0,014	0,014	0,010	0,012	0,013	0,014	0,017	0,015	0,037
ITA	0,002	0,002	0,002	0,002	0,003	0,005	0,007	0,008	0,009	0,011	0,012	0,012	0,009	0,009	0,009	0,010	0,011	0,012	0,016	0,017	0,026
GRE	0,007	0,008	0,009	0,011	0,013	0,014	0,015	0,016	0,017	0,018	0,007	0,008	0,008	0,009	0,009	0,009	0,010	0,011	0,011	0,013	0,014

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 1980-1999 annual data.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

Table 7: Inward FDI / Capital Stock (Selected EU countries, ø EU Core and USA), Annual Data for 2000-2017, sorted by descending order for 2017

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
LUX			0,406	0,658	0,753	0,660	0,707	1,067	0,882	1,131	1,128	1,329	0,855	0,919	1,156	0,926	0,928	0,859
IRL	0,430	0,417	0,531	0,616	0,498	0,358	0,253	0,261	0,232	0,315	0,319	0,318	0,396	0,399	0,412	0,794	0,678	0,815
NLD	0,150	0,173	0,209	0,260	0,275	0,232	0,228	0,267	0,224	0,219	0,174	0,177	0,184	0,191	0,371	0,305	0,343	0,407
BEL	0,173	0,176				0,264	0,290	0,448	0,203	0,215	0,201	0,203	0,211	0,228	0,200	0,191	0,178	0,199
SWE	0,088	0,087	0,114	0,149	0,184	0,160	0,178	0,202	0,177	0,209	0,208	0,206	0,205	0,193	0,154	0,147	0,142	0,159
UK	0,087	0,095	0,097	0,108	0,116	0,123	0,144	0,152	0,108	0,113	0,107	0,121	0,134	0,124	0,128	0,114	0,113	0,137
EST	0,052	0,060	0,083	0,120	0,153	0,146	0,128	0,146	0,126	0,118	0,111	0,106	0,120	0,133	0,121	0,110	0,112	0,129
USA	0,074	0,065	0,050	0,058	0,061	0,059	0,065	0,068	0,047	0,058	0,067	0,067	0,074	0,091	0,097	0,099	0,111	0,129
POL	0,030	0,036	0,041	0,048	0,066	0,062	0,081	0,119	0,097	0,106	0,105	0,088	0,101	0,111	0,095	0,078	0,075	0,090
SVK	0,028	0,031	0,050	0,084	0,098	0,092	0,103	0,117	0,113	0,114	0,109	0,108	0,106	0,105	0,079	0,072	0,072	0,086
FIN	0,042	0,042	0,061	0,088	0,093	0,080	0,092	0,113	0,091	0,087	0,088	0,088	0,089	0,082	0,086	0,076	0,072	0,082
DNK	0,118	0,116	0,129	0,150	0,100	0,094	0,102	0,118	0,097	0,095	0,082	0,078	0,078	0,072	0,072	0,068	0,069	0,078
AUT	0,032	0,036	0,048	0,060	0,069	0,075	0,088	0,121	0,101	0,108	0,099	0,088	0,084	0,087	0,081	0,068	0,061	0,078
PRT	0,035	0,040	0,051	0,066	0,068	0,057	0,066	0,076	0,065	0,069	0,061	0,057	0,059	0,068	0,058	0,057	0,053	0,069
CZE	0,018	0,023	0,033	0,037	0,044	0,043	0,050	0,066	0,062	0,070	0,074	0,065	0,070	0,067	0,058	0,056	0,055	0,068
ESP	0,048	0,056	0,078	0,096	0,100	0,083	0,075	0,078	0,074	0,078	0,075	0,074	0,067	0,074	0,064	0,059	0,058	0,067
HUN	0,052	0,054	0,073	0,089	0,108	0,101	0,113	0,121	0,096	0,098	0,088	0,080	0,090	0,088	0,080	0,065	0,058	0,066
LTU	0,022	0,023	0,035	0,039	0,050	0,061	0,071	0,084	0,064	0,072	0,063	0,065	0,066	0,068	0,057	0,052	0,050	0,060
FRA	0,035	0,037	0,047	0,064	0,063	0,052	0,057	0,065	0,055	0,062	0,056	0,060	0,057	0,060	0,052	0,050	0,049	0,054
EU Core (ø)	0,042	0,041	0,052	0,067	0,067	0,055	0,061	0,069	0,061	0,065	0,062	0,064	0,063	0,059	0,050	0,046	0,046	0,052
DEU	0,050	0,045	0,057	0,071	0,071	0,059	0,066	0,073	0,066	0,069	0,067	0,067	0,069	0,058	0,048	0,043	0,043	0,051
LVA	0,019	0,020	0,022	0,025	0,035	0,033	0,037	0,052	0,044	0,051	0,046	0,043	0,043	0,048	0,041	0,042	0,037	0,044
SVN	0,013	0,014	0,023	0,034	0,034	0,029	0,034	0,042	0,043	0,040	0,036	0,037	0,034	0,031	0,031	0,030	0,031	0,037
ITA	0,018	0,017	0,020	0,027	0,031	0,029	0,033	0,037	0,029	0,030	0,029	0,029	0,026	0,025	0,024	0,022	0,021	0,026
GRE	0,012	0,012	0,013	0,018	0,021	0,021	0,024	0,029	0,020	0,022	0,019	0,017	0,012	0,011	0,009	0,010	0,010	0,014

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 2000-2017 annual data.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

Table 8: Difference between Outward FDI Stock Relative to Source Country Capital Stock and Inward FDI stock relative to capital stock (selected EU countries, ø EU Core and USA), 1980-1999, sorted by descending order for 2017

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2017
LUX																					0,353
NLD	0,028	0,025	0,025	0,026	0,026	0,027	0,024	0,027	0,029	0,031	0,032	0,036	0,034	0,031	0,033	0,036	0,043	0,049	0,040	0,043	0,201
DNK	-0,005	-0,003	-0,003	-0,004	-0,003	-0,005	-0,005	-0,006	-0,004	-0,002	-0,004	0,002	0,004	0,002	0,003	0,002	0,009	0,010	0,005	0,006	0,056
FRAU	-0,002	-0,001	-0,001	-0,001	-0,001	-0,001	0,000	0,001	-0,001	0,002	0,004	0,005	0,006	0,005	0,004	0,027	0,025	0,035	0,037	0,040	0,041
BEL	-0,002	-0,005	-0,008	-0,009	-0,009	-0,013	-0,018	-0,016	-0,020	-0,024	-0,022	-0,026	-0,023	-0,034	-0,037	-0,031	-0,035	-0,032	-0,042	-0,025	0,039
EU Core*	0,000	0,000	0,001	0,001	0,001	0,002	0,002	0,003	0,003	0,004	0,008	0,009	0,011	0,011	0,011	0,024	0,026	0,034	0,036	0,029	0,039
DEU	0,001	0,002	0,002	0,003	0,003	0,004	0,005	0,006	0,007	0,006	0,012	0,014	0,015	0,016	0,019	0,021	0,027	0,032	0,035	0,019	0,036
FIN	0,000	-0,001	-0,001	-0,001	0,001	0,001	0,002	0,004	0,005	0,007	0,011	0,012	0,010	0,010	0,010	0,011	0,016	0,020	0,023	0,028	0,030
AUT	-0,007	-0,006	-0,006	-0,004	-0,004	-0,005	-0,007	-0,009	-0,009	-0,009	-0,009	-0,008	-0,007	-0,005	-0,006	-0,008	-0,007	-0,006	-0,006	-0,005	0,015
ITA	0,000	0,000	0,000	0,000	0,000	-0,001	0,000	0,000	0,000	-0,001	0,000	0,002	0,004	0,004	0,005	0,006	0,006	0,008	0,010	0,009	0,007
SWE	0,001	0,002	0,004	0,005	0,006	0,010	0,015	0,021	0,025	0,035	0,046	0,042	0,038	0,034	0,037	0,040	0,034	0,034	0,040	0,031	0,007
USA	0,006	0,005	0,004	0,005	0,004	0,007	0,010	0,011	0,011	0,011	0,007	0,006	0,004	0,010	0,012	0,012	0,012	0,007	0,003	0,001	0,000
UK	0,006	0,010	0,011	0,010	0,014	0,012	0,014	0,014	0,017	0,013	0,007	0,007	0,013	0,017	0,020	0,023	0,021	0,022	0,030	0,060	-0,002
GRE							-0,010	-0,011	-0,013	-0,014	-0,004	-0,005	-0,005	-0,006	-0,006	-0,007	-0,008	-0,008	-0,009	-0,010	-0,005
ESP	-0,002	-0,001	-0,001	-0,001	-0,002	-0,003	-0,005	-0,009	-0,011	-0,016	-0,024	-0,026	-0,022	-0,021	-0,023	-0,024	-0,022	-0,017	-0,020	-0,009	-0,009
SVN													-0,010	-0,010	-0,007	-0,009	-0,010	-0,011	-0,013	-0,012	-0,021
LVA													0,002	0,002	-0,002	-0,004	-0,008	-0,011	-0,013	-0,016	-0,039
PRT	-0,009	-0,009	-0,009	-0,009	-0,009	-0,009	-0,009	-0,010	-0,011	-0,013	-0,015	-0,017	-0,017	-0,019	-0,019	-0,018	-0,019	-0,019	-0,022	-0,016	-0,040
HUN											-0,001	-0,005	-0,009	-0,014	-0,017	-0,027	-0,031	-0,042	-0,049	-0,055	-0,045
LTU															-0,004	-0,004	-0,008	-0,011	-0,016	-0,019	-0,047
CZE														-0,004	-0,004	-0,006	-0,007	-0,007	-0,011	-0,014	-0,054
IRL						-0,201	-0,197	-0,191	-0,177	-0,156	-0,145	-0,141	-0,137	-0,130	-0,121	-0,116	-0,117	-0,119	-0,159	-0,165	-0,055
POL											0,000	0,000	-0,002	-0,003	-0,004	-0,008	-0,011	-0,014	-0,021	-0,024	-0,079
SVK														-0,002	-0,003	-0,004	-0,006	-0,007	-0,013	-0,016	-0,080
EST													-0,001	-0,004	-0,008	-0,012	-0,014	-0,018	-0,031	-0,043	-0,047

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 1980-1999 annual data.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

Table 9: Difference between Outward FDI Stock Relative to Source Country Capital Stock and Inward FDI Stock Relative to Capital Stock (Selected EU Countries, ø EU Core and USA), 2000-2017, sorted by descending order for 2017

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
LUX			-0,124	-0,227	-0,224	-0,040	-0,136	-0,164	0,267	0,030	0,097	-0,342	-0,231	-0,088	-0,237	-0,036	0,042	0,353
NLD	0,038	0,030	0,028	0,055	0,060	0,076	0,104	0,062	0,087	0,108	0,112	0,112	0,096	0,090	0,155	0,138	0,193	0,201
DK	-0,001	0,004	0,006	0,004	0,014	0,017	0,014	0,017	0,035	0,046	0,057	0,061	0,068	0,073	0,054	0,054	0,049	0,056
FRA	0,034	0,039	0,036	0,036	0,033	0,035	0,038	0,040	0,036	0,045	0,048	0,047	0,050	0,044	0,044	0,042	0,041	0,041
BEL	-0,014	-0,019				0,070	0,083	-0,090	-0,022	-0,012	-0,018	-0,020	-0,021	-0,013	0,008	0,019	0,027	0,039
EU Core*	0,018	0,027	0,023	0,021	0,020	0,024	0,027	0,031	0,028	0,035	0,039	0,038	0,041	0,038	0,037	0,037	0,036	0,039
DEU	0,001	0,014	0,010	0,005	0,007	0,014	0,015	0,023	0,020	0,026	0,029	0,030	0,032	0,032	0,030	0,032	0,031	0,036
FIN	0,049	0,049	0,054	0,045	0,045	0,040	0,033	0,031	0,034	0,046	0,052	0,044	0,050	0,052	0,022	0,012	0,026	0,030
AUT	-0,007	-0,007	-0,003	-0,002	-0,001	-0,010	-0,003	-0,007	0,002	0,001	0,013	0,023	0,023	0,026	0,019	0,019	0,019	0,015
ITA	0,007	0,008	0,005	0,002	0,000	0,001	0,000	0,004	0,010	0,010	0,015	0,013	0,011	0,012	0,008	0,007	0,006	0,007
SWE	0,028	0,029	0,027	0,030	0,022	0,041	0,036	0,035	0,035	0,023	0,025	0,023	0,013	0,022	0,038	0,018	0,017	0,007
USA	-0,002	-0,006	0,000	0,007	0,015	0,017	0,023	0,033	0,012	0,026	0,027	0,020	0,025	0,024	0,015	0,006	-0,003	0,000
UK	0,100	0,084	0,108	0,127	0,118	0,070	0,060	0,097	0,085	0,068	0,062	0,059	0,024	0,023	0,008	0,006	0,008	-0,002
GRE	-0,007	-0,006	-0,006	-0,008	-0,011	-0,011	-0,011	-0,012	0,000	0,001	0,004	0,011	0,009	0,004	0,003	0,000	-0,003	-0,005
ESP	-0,008	-0,011	-0,028	-0,033	-0,031	-0,017	-0,004	-0,001	0,000	-0,001	0,003	0,003	-0,003	-0,008	-0,008	-0,005	-0,005	-0,009
SVN	-0,009	-0,008	-0,014	-0,021	-0,020	-0,015	-0,017	-0,013	-0,013	-0,009	-0,008	-0,012	-0,013	-0,013	-0,015	-0,016	-0,017	-0,021
LVA	-0,018	-0,020	-0,021	-0,024	-0,033	-0,031	-0,035	-0,047	-0,040	-0,047	-0,042	-0,040	-0,040	-0,043	-0,037	-0,038	-0,033	-0,039
PRT	-0,015	-0,017	-0,024	-0,027	-0,022	-0,017	-0,023	-0,028	-0,023	-0,027	-0,025	-0,020	-0,027	-0,031	-0,031	-0,030	-0,028	-0,040
HUN	-0,049	-0,051	-0,067	-0,079	-0,094	-0,085	-0,092	-0,094	-0,073	-0,075	-0,065	-0,054	-0,056	-0,056	-0,048	-0,038	-0,041	-0,045
LTU	-0,021	-0,022	-0,034	-0,038	-0,047	-0,056	-0,064	-0,075	-0,054	-0,058	-0,052	-0,052	-0,052	-0,054	-0,045	-0,040	-0,039	-0,047
CZE	-0,018	-0,022	-0,032	-0,035	-0,041	-0,040	-0,047	-0,061	-0,055	-0,062	-0,066	-0,058	-0,061	-0,056	-0,049	-0,047	-0,046	-0,054
IRL	-0,336	-0,290	-0,360	-0,413	-0,242	-0,130	-0,058	-0,069	-0,024	0,057	0,061	0,044	0,030	0,116	0,181	0,017	0,013	-0,055
POL	-0,030	-0,036	-0,041	-0,048	-0,065	-0,060	-0,078	-0,113	-0,091	-0,098	-0,096	-0,078	-0,087	-0,096	-0,083	-0,066	-0,064	-0,079
SVK	-0,026	-0,029	-0,047	-0,079	-0,095	-0,090	-0,099	-0,112	-0,106	-0,107	-0,102	-0,100	-0,096	-0,097	-0,075	-0,068	-0,068	-0,080
EST	-0,047	-0,052	-0,070	-0,102	-0,132	-0,121	-0,091	-0,090	-0,073	-0,071	-0,072	-0,075	-0,081	-0,092	-0,085	-0,075	-0,076	-0,087

Note: ø EU Core represents the unweighted mean figure for Germany plus France; 2000-2017 annual data.
Source: Own calculations and representation of FDI stock data from UNCTAD and capital stock data from the Penn World Table, version 9.1, Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182, available for download at www.ggdc.net/pwt

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