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FDI Globalization and the New Phillips Curve: Role of Multinational Companies and Institutional Changes

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Summary:

There has been some recent debate about changes in the Phillips curve in the context of economic globalization and a flattening of the curve, respectively. Little evidence has been found in support of such links so far. However, our analysis shows that both inward FDI stock variables and outward FDI stock variables significantly affect the Phillips curve and the inflation-unemployment trade-off in the medium term. In the Euro Area, the inward FDI stock variable raises the slope of the Phillips curve, while the outward FDI stock variable brings a flattening of the Phillips curve; the latter effect is not observed in the case of the UK and in the case of the US there are no clear FDI effects. Furthermore, we consider – also for the first time in the literature – the impact of product innovations and process innovations. For the UK and the Euro Area, we find significant parameters for the variables mentioned. The analysis clearly suggests that foreign direct investment is crucial for understanding key macroeconomic variables; thus the findings could reinforce new DSGE research perspectives by ROEGER/WELFENS (2021) who have developed a new macro model with FDI. The OECD should urgently consider providing more data on FDI – for example, sector FDI stock data – and on product innovations and process innovations.

Zusammenfassung:

In letzter Zeit gab es einige Diskussionen über Veränderungen der Phillips-Kurve im Zusammenhang mit der wirtschaftlichen Globalisierung bzw. einer Abflachung der Kurve. Bislang wurden nur wenige Belege für solche Zusammenhänge gefunden. Unsere Analyse zeigt jedoch, dass sowohl die Variablen für den Bestand an ausländischen Direktinvestitionen im Inland als auch die Variablen für den Bestand an ausländischen Direktinvestitionen im Ausland die Phillips-Kurve und den Trade-off zwischen Inflation und Arbeitslosigkeit mittelfristig erheblich beeinflussen. Im Euroraum erhöht die Variable für den Bestand an ausländischen Direktinvestitionen die Steigung der Phillips-Kurve, während die Variable für den Bestand an ausländischen Direktinvestitionen eine Abflachung der Phillips-Kurve bewirkt; der letztgenannte Effekt wird im Fall des Vereinigten Königreichs nicht beobachtet, und im Fall der USA gibt es keine eindeutigen Auswirkungen von ausländischen Direktinvestitionen. Darüber hinaus betrachten wir - ebenfalls zum ersten Mal in der Literatur - die Auswirkungen von Produkt- und Prozessinnovationen. Für das Vereinigte Königreich und die Eurozone finden wir signifikante Parameter für die genannten Variablen. Die Analyse deutet eindeutig darauf hin, dass ausländische Direktinvestitionen für das Verständnis wichtiger makroökonomischer Variablen von entscheidender Bedeutung sind; somit könnten die Ergebnisse die neuen DSGE-Forschungsperspektiven von ROEGER/WELFENS (2021) untermauern, die ein neues Makromodell mit FDI entwickelt haben. Die OECD sollte dringend in Erwägung ziehen, mehr Daten zu FDI - zum Beispiel sektorale FDI-Bestandsdaten - und zu Produkt- und Prozessinnovationen bereitzustellen.

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1. Introduction

The Phillips curve has been a major analytical approach in macroeconomics since the late 1960s: fundamentally, the Phillips curve is a concept which assumes that there is a medium-term trade-off between price stability and full employment – with a given inflation expectation on the side of workers/trade unions and firms/employer federations, in the Keynesian Phillips curve approach one should witness that an expansionary inflationary monetary policy will bring about a transitory decline in the unemployment rate and an increase in the inflation rate; provided that there are adaptive expectations. On the other hand, there are rational expectations plus market imperfections which bring about costly adjustment of firms: the typical case of a New Keynesian Phillips curve model which often is part of a DSGE model (SMETS/WOUTERS, 2007); the relevant Calvo adjustment parameter (CALVO, 1983) indicates the percentage of firms which can immediately adjust prices in response to shocks on the demand side or the supply side, respectively. In the long run there should be no negative trade-off between inflation and unemployment since, in a setting with adaptive expectations, one should expect that after some time actual and expected inflation rates are identical; as FRIEDMAN (1977) has emphasized, there could be a positive slope of the long run Phillips curve. This issue is part of the subsequent analysis where the endogenous variable considered is the ratio of the inflation rate to (1+unemployment rate) – with annual data used for selected countries.

As regards the New Keynesian Phillips curve – which contains rigidities in goods markets and factor markets - part of the theoretical and empirical literature with reference to the US (GUAY/PELGRIN, 2004) considers both a backward-looking inflation element and a forward-looking expectation element. The latter element is more important than the former aspect which is an approach often used in the empirical New Keynesian Phillips curve modelling.

The flattening of the Phillips curve which has been observed in the three decades since 1990 in OECD countries is a phenomenon which has not been explained in the literature thus far in a satisfactory way, unless one could argue that the monetary policy regime in so many countries has become more credible and stricter at the same time; one cannot rule out that such a change in monetary policy strategies has indeed taken place, namely as more and more countries' central banks switched to rather strict Taylor rule. One can also not rule out that the increasing role of information and communication technologies (ICTs) and digital goods sold via the internet has contributed over time to structurally lower inflation rates in OECD countries: IMF research has presented empirical evidence that the internet has contributed to lower inflation rates (CSONTO/HUANG/TOVAR, 2019). Stronger international competition in the context of economic globalization has been considered to be a potential element which could explain the flattening of the Phillips curve. However, an empirical analysis for 2,000 Italian firms has not confirmed that economic globalization – taking into account the role of trade - has brought about a flattening of the curve (GAIOTTI, 2008).

However, economic globalization is not linked to more trade, rather a consistent phenomenon of globalization has been the rising role of multinational companies (MNCs). MNCs are typically considered to be firms with ownership specific advantages (DUNNING, 1958;

1980), often technology advantages, which are the basis of profitable production abroad. Asset-seeking outward foreign direct investment (FDI) could also play a role – in the case that MNCs acquire knowledge-oriented or technology-oriented firms in OECD countries. As production technology and technological progress to some extent is linked to competitive prices which indeed should fall in the case of process innovations, the role of MNCs should be discussed in the context of the Phillips curve. To the extent that cumulated inward FDI has become a crucial aspect of many OECD countries, international technology transfers as well as a more interdependent supply response of firms in key markets could be an important element of reality for many economies. In small open economies with a few affiliates of major MNCs in certain sectors, one might have to consider various forms of oligopolistic price interdependency so that follow-the-leader behavior could become more important in terms of the price setting of firms acting in markets with differentiated goods and product innovations, respectively.

In the following analysis a new approach is considered, namely one which considers the role of both inward FDI and outward FDI; the focus will be on the role of FDI outward stocks relative to the capital stock of the source country on the one hand, and on the role of FDI inward FDI stocks relative to the capital stock of the host country on the other. Some basic theoretical considerations are introduced in Section 2, while Sections 3 and 4 present the model and regression results, respectively. The final section takes a closer look at the economic policy conclusions.

The findings of the empirical analysis presented herein is that both inward and outward FDI stocks play a role in the Phillips curve in Europe – read: the UK and the Euro Area; but not so much in the US. As data on product innovations and process innovations are available for EU countries only, the analysis which looks into the role of innovations brings some first results for the Euro Area and the UK, respectively. FDI globalization thus seems to play a key role for a New Phillips curve.

2. Theoretical Aspects of FDI Stock Ratios and Inflation plus Unemployment

Wage setting in open economies is naturally considered to part of the Phillips curve debate. As regards the outward FDI stock ratio, a rise of the ratio implies that firms in country *i* have more opportunities to relocate production – at least potentially – to a competitor country *j* (1,2…*N*). Hence, the outward FDI stock ratio should reduce the wage pressure for a given expected inflation rate. Hence, the outward FDI stock ratio should also be dampening the relative inflation (π) pressure; by this one may understand the ratio $\pi/(1+u)$ which will be considered subsequently in the empirical part as the relevant endogenous variable (where u denotes the unemployment rate) – this variable effectively reflects the slope of an enhanced "globalization Phillips curve" in π-u space. The traditional Phillips curve would be written (with π^E as expected inflation rate) as:

$$\pi_t = a_0 - a_1 u_t + a_2 \pi_t^E \qquad (1)$$

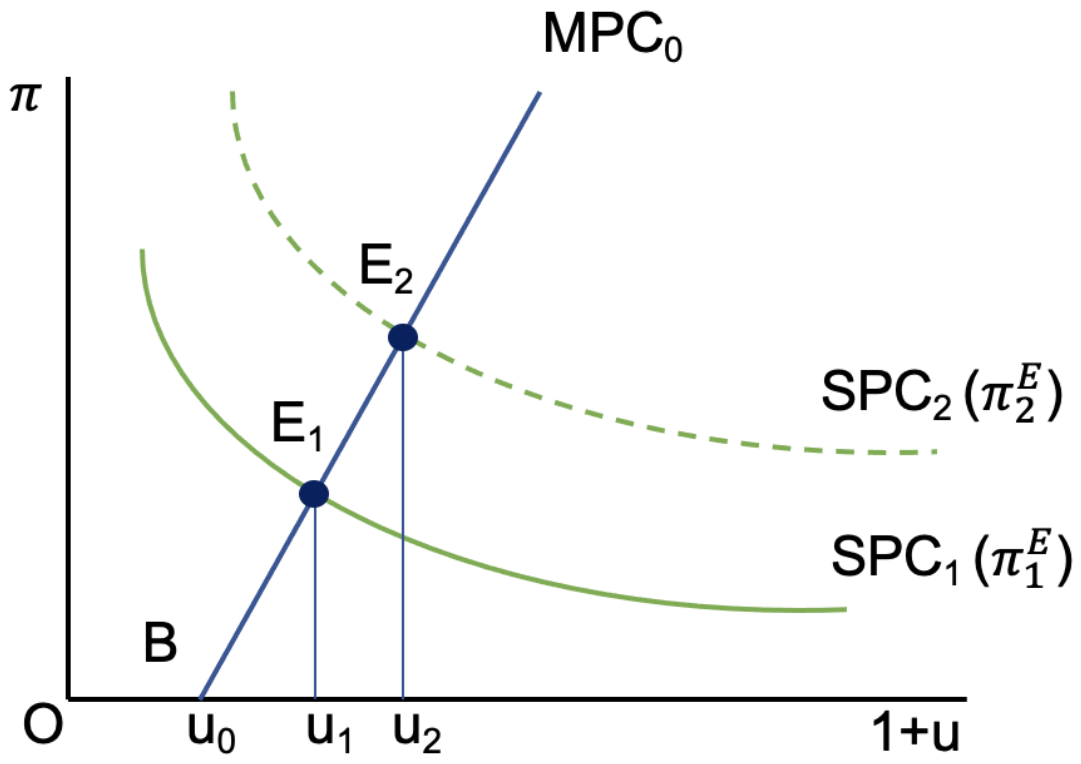
The parameters in this standard Phillips curve are positive. In the case of perfect foresight, the above Phillips curve becomes:

$$(1 - a_2)\pi_t = a_0 - a_1 u_t \qquad (2)$$

Here, the ratio $(1 - a_2)/a_1$ would indicate the long run trade-off ratio $du/d\pi$; in the case that $a_2 = 1$, there is, of course, no trade-off between the inflation rate and the unemployment rate. The expected inflation rate relevant for equation (1) could be taken for the purposes of an empirical analysis from inflation rate surveys (such as the professional forecasters' survey of the European Central Bank for the case of the Euro Area) or as the difference between the nominal interest rate (*i*) on a representative government bond and a bond with inflation indexation so that the latter's interest rate would represent the real interest rate (*r*). Moreover, the difference between the growth rate of the money supply (say, for M3) and the growth rate of the production potential could be considered as a proxy for the expected inflation rate if one wants to use a simple quasi-rational Phillips curve approach.

The short term Phillips curve (SPC) in a π-u diagram – here in a π-(1+u) diagram – has a negative slope and changing inflation expectations will lead to a shift of the SPC schedule. As regards the medium term Phillips curve (MPC, based on annual data) which represents a situation in which forward-looking inflation expectations are in line with the actual inflation rate should have a positive slope or a negative slope or a zero slope – the slope will depend on institutional settings in the labor markets and the goods markets.

Figure 1: Phillips Curve Perspectives in the Short Run and the Medium Term



The medium term Phillips curve can be written in a straightforward form as:

$$\pi_t = b_0 - b_1(1 + u_t) + b_2 Z_t'' \quad (3)$$

where Z_t'' stands for certain economic variables; for example, inward FDI stock ratio and outward FDI stock ratio. An alternative approach – looking at the slope of the long run Phillips curve - could be (with g^M denoting the growth rate of the money supply):

$$\frac{\pi_t}{1 + u_t} = b_0' + b_1' Z_t'' + b_2' g_t^M \quad (4)$$

Equation (4) assumes – with coefficients b_0' and b_1' – that there will be an interaction term uZ'' which, however, could possibly be neglected if b_1' is rather small and u is rather small; as Milton Friedman assumed that there is a vertical long run Phillips curve or a long run Phillips curve with a positive slope, there is a particular interest in the coefficient b_0'. The regression equation to be considered subsequently puts the focus on equation (4).

In the short run the expected inflation rate is a driver of the growth rate of the nominal wage rate as fixed in contracts between trade unions and employer federations. In a traditional Keynesian Phillips curve approach, one can state that for a given short run Phillips curve, an inflationary monetary policy (with the growth rate of the monetary aggregate M3 exceeding the growth rate of potential output) drives up the actual inflation rate so that the real wage W/P (W is the nominal wage rate and P the output price level) will decline and therefore employment will increase – hence the unemployment rate will fall in a setting with adaptive expectations; or in a setting with rational expectations and adjustment costs in labor market contracts and other imperfections in both factor and goods markets (for example, only some of the firms are able or willing to adjust market prices immediately which could play a role in oligopolistic markets). If the expected inflation rate is raised, the short-term Phillips curve would shift upwards in π-u space.

Since the 1980s there has been a strong growth of foreign direct investment in the world economy (UNCTAD, 2020) and rising trade in intermediate products could be observed which partly reflects more international offshoring within multinational companies; the ratio of outward FDI stocks relative to source countries' capital stocks in leading OECD countries has strongly increased between 1990s and 2017, reaching about 13 percent in the UK and the US in 2017 and somewhat higher figures in some of the smaller EU countries (here, we disregard Luxembourg and Belgium where statistics are distorted through holding company issues). Economic globalization indeed accelerated during the 1990s and in particular in the first decades of the 21st century; not least because of the expansion of ICT which facilitates the creation of larger (i.e., more widespread) international production networks. Globalization has to some extent been reinforced by more regional integration in Europe, Asia and Latin America in the past decades (albeit with BREXIT as an exceptional case of disintegration in the case of the European Union). Economic globalization has flourished both in the form of more offshoring as well as more international outsourcing; the latter refers to firms buying intermediate imported products in the world market.

Since the FDI inward stock variable will typically react to variables such as the regional integration of the respective country (WELFENS/BAIER, 2018; BAIER/WELFENS, 2019) and the real exchange rate (see, e.g., FROOT/STEIN, 1991), there are crucial links between

institutional and macroeconomic variables and FDI stock variables on the one hand. On the other hand, FDI stocks should go along with more international technology transfers, possibly including product innovations and process innovations (see, e.g., BARANSON, 1970); and the FDI variable is also found in a new DSGE analysis to play a key role for major macroeconomic adjustment processes and the efficiency of monetary and fiscal policy (ROEGER/WELFENS, 2021).

As regards the inward FDI stock relative to the host country capital stock, one may assume that a stronger presence of multinational companies means more market power and hence a stronger ability of firms to raise the growth rate of prices (with a given growth rate of the money supply); this is the *MNC market power hypothesis* (a). In this perspective at least, during an economic upswing the mark-up rates are rising which translates into a higher inflation rate. Thus, one may expect a positive link between the inward FDI stock variable and the inflation rate.

Assuming that the FDI outward capital stock in affiliates is mainly used to produce goods similar to those produced in the host country – i.e., in the headquarter companies – or that affiliates represent the production of intermediate products as inputs for the final products assembled in the headquarter company's production of final goods, one may expect that the leverage of trade unions in the companies of the respective source country is weakened: if a trade union's wage bargaining approach in the headquarter country is too aggressive (here referring to the wage pressure relative to labor productivity growth), the headquarter company's management can credibly threaten to relocate more production to foreign subsidiaries. This is the *globalization-related, outward FDI-stock wage growth moderation hypothesis* (b) which should be relevant for Euro Area countries, in particular for countries such as Germany, France, the Netherlands and other countries with a high share of value-added in manufacturing industry relative to total output. Trade unions traditionally play a considerable role in manufacturing industries. One may point out that for some of Germany's large multinational companies, raising production abroad amounts to an effective weakening of trade unions through a moderation effect in co-determination which is enshrined in Germany's national economic order. Economic FDI globalization thus can have a considerable influence on changes of the economic institutions.

In an economy which is strongly specialized in services, the outward FDI stock variable could play a somewhat different role to the extent that services firms' international growth in the provision of services abroad represents largely a higher market power in internationally integrated markets of banks and firms. This is the *global services market power hypothesis* (c) which might be relevant for such countries as the UK or the US.

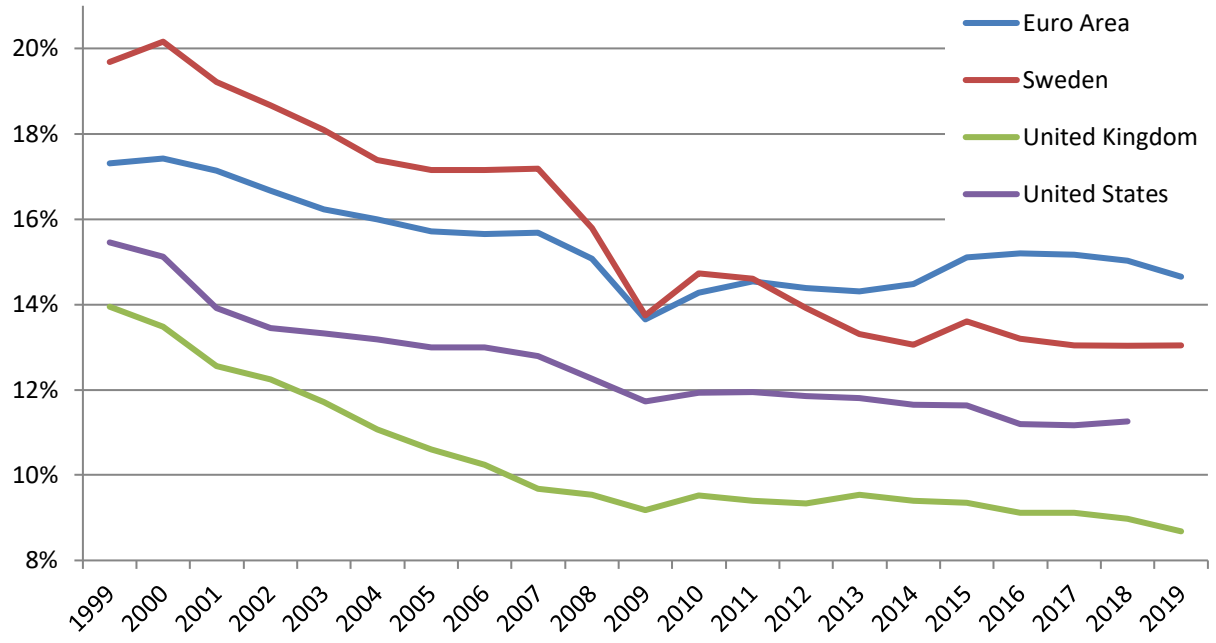
As regards the outward FDI stock ratio, one might raise the question of whether or not MNCs' foreign affiliates might exert political lobbying pressure on the government and the central bank of the respective host country to develop a monetary policy which is more geared towards low inflation rates; and this indirectly puts pressure on the central bank in the respective host country to come up with a less inflationary policy. Moreover, there could be an effect via affiliates abroad, namely that the ratio of inflation to the unemployment rate is falling as a higher inward FDI stock ratio implies that more jobs are created in the context of positive technology transfer effects or greenfield FDI effects in the respective host country. To completely disentangle the various hypotheses in the course of a regression analysis is

often not a straightforward task. One may emphasize that the structure of the economy might also be relevant for the inflation-unemployment trade-off.

The following table (Table 1) shows the difference in the share of value-added in the manufacturing industries of OECD countries. The US, the UK and a few other countries are rather services-oriented, while some Euro Area countries still show considerable shares of manufacturing industries. The share of manufacturing output in the Euro Area is clearly higher than in the US and the UK. In the latter two countries, the share of manufacturing output has strongly fallen over time. The Euro Area's share was about 15 percent in 2019 while that of the UK was only about 9 percent (see Table 1).

As regards links between inflation, unemployment and the FDI stock variable one cannot, of course, rule out that the inflation rate negatively has an impact on the FDI inward stock variable since foreign investors could interpret a high inflation rate as an indicator of economic instability and also as a driver of unfavorable tax distortions for investors. A high unemployment rate also could affect the inward FDI stock variable negatively. Finally, inflation and the unemployment rate could affect the outward FDI stock variable; these aspects are not considered here.

Figure 2: Share of Manufacturing Industry Output in GDP (in Percent) for the Euro Area, Sweden, the UK and the US, 1999-2019



Note: This figure shows for the Euro Area, Sweden, the UK and the US the value-added of the manufacturing industry as a share of national GDP.
Source: OECD National Accounts database, own calculations

Table 1: Share of Manufacturing Industry Output in GDP (in Percent) for OECD Countries, 1985-2019

Country	1985	1995	2000	2005	2010	2015	2019
Ireland	-	20.70%	23.10%	19.60%	19.50%	34.90%	31.50%
R. of Korea	24.20%	25.80%	26.40%	25.70%	27.40%	26.60%	25.30%
Czech Republic	-	21.60%	23.40%	22.60%	21.00%	23.90%	22.40%
Slovenia	-	21.60%	21.70%	20.60%	17.50%	19.90%	20.60%
Germany	27.60%	20.50%	20.50%	20.10%	19.70%	20.30%	19.10%
Turkey	-	-	18.70%	16.90%	15.10%	16.70%	18.30%
Switzerland	-	19.00%	17.70%	18.90%	18.20%	17.50%	18.20%
Slovak Republic	-	19.00%	20.00%	20.60%	18.10%	19.50%	18.10%
Hungary	-	18.20%	19.10%	19.10%	18.10%	20.20%	17.70%
Mexico	-	19.30%	19.10%	15.80%	15.70%	17.30%	17.40%
Austria	20.00%	17.90%	18.20%	17.40%	16.50%	16.70%	16.60%
Poland	-	19.40%	16.10%	16.00%	15.30%	17.50%	16.60%
Lithuania	-	16.70%	16.80%	18.30%	16.90%	17.20%	16.10%
Italy	-	19.00%	17.60%	15.50%	14.20%	14.40%	14.90%
Finland	21.70%	22.20%	24.20%	21.20%	17.00%	14.70%	14.70%
Euro Area	-	18.00%	17.40%	15.70%	14.30%	15.10%	14.60%
Denmark	15.90%	14.70%	14.10%	12.00%	10.90%	12.40%	13.20%
Sweden	21.20%	19.80%	20.20%	17.20%	14.70%	13.60%	13.00%
Estonia	-	17.00%	15.40%	14.70%	13.60%	13.80%	12.80%
Belgium	-	18.30%	17.50%	15.90%	13.30%	12.70%	12.20%
Portugal	-	15.90%	15.00%	12.60%	11.60%	12.10%	12.00%
Spain	-	16.30%	16.20%	13.70%	11.40%	11.30%	11.20%
Israel	-	15.90%	16.70%	15.20%	14.30%	13.00%	10.90%
Netherlands	16.10%	15.30%	13.40%	12.30%	10.50%	10.80%	10.90%
Latvia	-	17.60%	13.60%	11.40%	11.90%	10.50%	10.40%
Chile	-	-	16.90%	14.30%	10.80%	11.70%	10.00%
France	17.30%	14.90%	14.50%	12.20%	10.30%	10.40%	9.80%
Canada	-	-	17.40%	13.70%	10.40%	10.00%	9.60%
Iceland	-	12.30%	11.70%	8.90%	12.90%	10.70%	8.80%
United Kingdom	-	15.50%	13.50%	10.60%	9.50%	9.40%	8.70%
Greece	-	11.00%	9.50%	8.60%	7.90%	8.30%	7.70%
Norway	11.40%	10.80%	8.80%	8.20%	7.20%	6.90%	6.30%
Australia	11.50%	12.80%	11.00%	9.90%	7.40%	6.10%	5.70%
Luxembourg	-	11.60%	9.60%	7.90%	5.20%	4.60%	4.60%
Colombia	-	-	-	16.00%	14.00%	12.40%	-
Japan	-	23.50%	22.60%	21.60%	20.80%	20.80%	-
New Zealand	23.10%	17.70%	15.50%	14.50%	10.80%	11.30%	-
United States	-	-	15.10%	13.00%	11.90%	11.60%	-

Note: This table shows for all OECD member countries (and the Euro Area) the value added of the manufacturing industry as a share of national GDP. For Germany, the value for 1985 is calculated by using the figures of the Former Federal Republic of Germany.
Source: OECD National Accounts database, own calculations

3. Factor Analysis Model

The empirical analysis in this section takes a look at various countries, including the UK, the US, the Euro Area (taken here as a 'country') and Sweden. The relevant FDI stock variables considered are FDI inward stock relative to the host country capital stock and FDI outward stock relative to the source country capital stock (see the appendix for a table with all variables considered and the relevant data sources). The basic approach considered for an assessment of the inflation-unemployment rate link is an equation based on differences (I(1) is the relevant framework for the FDI stock variables):

$$d\left(\frac{\pi_{i,t}}{1+u_{i,t}}\right) = b_0 + b_1 d\left(\frac{FDI_{i,t}^{inw}}{K_{i,t}}\right) + b_2 d\left(\frac{FDI_{i,t}^{out}}{K_{i,t}}\right) + b_3 g_{i,t}^{M3} + \varepsilon_{i,t}, \qquad (5)$$

where $FDI_{i,t}^{inw}$ and $FDI_{i,t}^{out}$ denote the inward and the outward FDI stock of country *i* in period *t*, respectively, $K_{i,t}$ denotes the capital stock of country *i* in period *t*, $g_{i,t}^{M3}$ denotes the growth rate of the broad money stock M3 of country *i* in period *t*, and $\varepsilon_{i,t}$ is a zero-mean residual.[1] Equation (5) considers the effect of economic FDI globalization on the inflation-unemployment rate trade-off in the medium term.

The basic globalization Phillips curve, $\frac{\pi}{1+u} = b_0 + b_1 d\left(\frac{FDI^{inw}}{K}\right) + b_2 d\left(\frac{FDI^{out}}{K}\right)$ implicitly corresponds to an enhanced Phillips curve – i.e., equation (4) with two FDI stock variables (inward and outward) – and interaction terms $ud\left(\frac{FDI^{inw}}{K}\right)$ and $ud\left(\frac{FDI^{out}}{K}\right)$ and ug^{M3}. The latter interaction term may be neglected if both the unemployment rate and the monetary growth rate are rather small; the other interaction terms also might be rather small in certain countries. Note, that if one considers instead of g^{M3} the term (g^{M3} – growth rate of the production potential), one would have a proxy for the inflation expectation. The modified globalization Phillips curve considered here, namely with the endogenous variable $\frac{\pi}{1+u}$ is, however, based on changes in the FDI stock variables mentioned.

The modified globalization Phillips curve approach is considered at first for the case of the Euro Area – here, we have data for both product innovations and process innovations for 2004-2016 – in the following analysis, in one equation variant product innovations and process innovations are additionally considered. The data for innovations in the Euro Area are from the European Union's Community Innovation Survey (CIS) which uses a panel of rather big firms and identifies which firms have had product innovations or process innovations – or both.

As regards equation (5), coefficient b_1 refers to the impact of higher mark-ups, b_2 refers to lower wage pressure in the presence of outward FDI in economies, typically with a rather strong manufacturing sector; both b_1 and b_3 should be positive; as regards b_2, a negative coefficient is expected. However, in an economy dominated by services, one may expect a negative coefficient b_2. The results for the Euro Area in the subsequent regression table

[1] For the US, we additionally take M2 which is known to be relevant in US inflation analysis; for the UK we additionally consider M4.

confirm the market power hypothesis (a) and the outward FDI wage moderation hypothesis (b).

4. Empirical Results

Using equation (3) for the Euro Area, we apply an ordinary least squares (OLS) regression to explore the factors that have an impact on the inflation-unemployment rate trade-off. The dependent variable for each country and also both FDI time series $\frac{FDI^{inw}}{K}$ and $\frac{FDI^{inw}}{K}$ are I(1), for which we use the first differences to avoid spurious regressions. For the monetary aggregate time series of the Euro Area and the UK, we also use the first differences, since these are also integrated in order of 1. Due to autocorrelated dependent variables, we perform OLS with Newey-West heteroskedasticity and autocorrelation consistent (HAC) standard errors.[2] Table 2 shows the results for the Euro Area, Sweden, UK and US, whereas Table 3 shows the results of using M2 and M4 for the US and UK, respectively.

For the Euro Area, the overall F-statistic speaks for the adequacy of the model (first specification). Moreover, after dropping the difference of the growth rate of M3 (in the second specification), the F-test of the constrained model composed of only both FDI ratio measures is also significant, able to explain about 9 percent of the variations of the dependent variable. In the first and the second specifications, both FDI ratios are significantly different from zero at the five and one percent level, respectively. The inward FDI ratio has a positive and the outward FDI ratio has a negative coefficient in accordance with the theoretical framework suggested. This means that higher inward FDI ratios significantly raise the trade-off between inflation and unemployment, whereas the outward FDI ratio has a negative link vis-á-vis the inflation-unemployment trade-off.

As regards the results for Sweden, which is not a member country of the Euro Area, the results indicate that the overall model is – according to the F-statistic – adequate, explaining about 31 percent of the variance of the difference of the inflation-unemployment trade-off. However, the F-statistic gets insignificant after dropping the growth rate of the monetary aggregate M3 from the model (i.e., in the second constrained specification). Furthermore, also taking into account that both FDI ratio coefficients of the constrained model are insignificant, FDI measures seem to have no significant impact in the case of Sweden.

Taking a closer look at the growth rate of M3, the results for the UK are shown in Table 2; but the better results are, of course, for M4 - whereby it is well-known that this broader monetary aggregate is adequate to use for inflation analysis in the UK (as shown in Table 3). The F-statistic of the M4 model specification, which is significant at the one percent level, confirms this suggestion. In the preferred approach with M4, it is apparent that the outward FDI stock ratio raises the inflation-unemployment trade-off, significantly different at the one percent level. One may assume that the very low share of manufacturing industry in the UK – much lower than in the Euro Area – explains this finding. If we drop the growth rate of the money supply (see Table 2, second specification), the R^2 statistics drops from 29 percent to 10

[2] Here, we use the Bartlett kernel to compute weights and an automatic bandwidth selection as described in NEWEY/WEST (1994).

percent, but the positive coefficient of the outward FDI ration is still significant at the 10 percent level (p-value=0.07), which supports the finding that higher outward FDI ratios increases the inflation-unemployment rate trade-off in the UK. To the extent that BREXIT should bring about a lower outward FDI stock ratio – for example, due to a real depreciation of the British Pound vis-à-vis the US dollar, the Euro and other major partner countries/currencies – the British inflation rate per unit of unemployment rate will be dampened; the role of a real appreciation of foreign currencies as a driver of more outward FDI, particularly in the form of international mergers & acquisitions, has been emphasized in a theoretical perspective of imperfect capital markets by FROOT/STEIN (1991); with empirical evidence for the United States.

In the case of the United States, neither the equation which includes the growth rate of M3 nor the equation with M2 – usually a prominent US variable for explaining inflation – show significant results with regard to either FDI ratio. Dropping the growth rate of the nominal money supply also does not improve the regression findings. Interestingly, in both estimations, the coefficients of the monetary aggregate measures are negative and – at least – significantly different from zero at the 5 percent level. Moreover, the growth rate of total loans to non-financial sectors can hardly explain the trade-off between inflation and unemployment in the US (see Table 4).[3] The US is more services oriented than the EU and the role of imported intermediate products – this possibly includes intermediates from US affiliates abroad - is lower than in the Euro Area. This might partly explain why outward FDI plays a smaller role in the US in terms of pricing in various sectors than in the Euro Area; moreover, as trade unions in the US are generally much weaker in industrial sectors than in the Euro Area, rising outward FDI stocks of US companies will not contribute much to weaker trade union bargaining power (compared to the case of the Euro Area). Strong competition in the integrated US domestic market might in turn undermine the ability of foreign subsidiaries to gain much market power in the US, while the more fragmented national markets for goods and services in the Euro Area are likely to bring rather favorable opportunities for subsidiaries of foreign MNCs to create market power over time in key sectors. However, it is noteworthy that the Constant is highly significant which means that the US medium term inflation equation can be written as $\pi(t) = Constant + Constant\, u(t)$ which implies a positive slope of the medium term Phillips curve. In the case of Sweden there is a negative significant Constant variable which implies a negative slope of the medium term Phillips curve.

[3] For this purpose, we use the time series "Total Credit to Private Non-Financial Sector in % of GDP" from FRED, Federal Reserve Bank of St. Louis.

Table 2: FDI Inward and FDI Outward Effects on the Inflation-Unemployment Trade-off for the Euro Area, Sweden, UK and US (with growth rate of money supply M3)

VARIABLES	COUNTRY							
	Euro Area		Sweden		UK		US	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Constant	-0.03 (0.06)	-0.03 (0.05)	-0.34** (0.16)	0.10 (0.12)	-0.04 (0.16)	-0.07 (0.21)	0.94*** (0.28)	0.00 (0.10)
$d\left(\frac{FDI^{inw}}{K}\right)$	39.27** (14.96)	67.98*** (12.68)	-22.50*** (6.72)	-14.31 (11.08)	-8.92 (11.37)	-10.96 (13.13)	-9.30 (20.71)	-1.33 (17.72)
$d\left(\frac{FDI^{out}}{K}\right)$	-31.49** (13.57)	-54.19*** (13.16)	12.93 (8.22)	7.56 (13.26)	12.79* (7.16)	12.99* (6.87)	7.23 (13.90)	2.28 (8.96)
g^{M3}	14.25*** (14.25)		6.49*** (2.17)		5.92 (4.59)		-14.70** (4.51)	
R^2	16.62%	8.96%	31.47%	4.35%	10.91%	5.10%	14.19%	0.13%
Wald F-Stat.	13.76***	15.84***	25..24***	0.95	2.17	1.83	3.70**	0.09
Sample	1997-2019		1997-2018		1997-2019		1997-2019	

Note: Using $d\left(\pi/1+u\right)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, and the growth rate of the money supply M3 g^{M3}. Since for the Euro Area and the UK g^{M3} is I(1), for these regressions the first difference of each time series is taken as the regressor to avoid spurious regressions. The corresponding Newey-West HAC standard errors are in parentheses. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.

As regards the UK, the outward FDI stock variable shows a positive significant coefficient while the growth rate of M4 is weakly significant – with a positive coefficient. In the US the Constant is significant and the growth rate of M2 – with a negative sign.

The replacement of the money supply variable by the growth rate of the change of the credit supply growth rate for the private sector does not improve the regression analysis (Table 4). One cannot rule out that a long period of US Quantitative Easing from 2009 to 2019 has affected the results presented here. In a next analytical step the focus will be on product innovations and process innovations – however, only for the Eurozone as no data on the US are available; for Sweden the time series is much too short so that this country also cannot be included in the next step.

Table 3: FDI Inward and FDI Outward Effects on the Inflation-Unemployment Trade-off in the UK and the US (with growth rate of money supply M2 and M4, respectively)

	COUNTRY	
VARIABLES	UK	US
Constant	-0.07 (0.18)	0.95*** (0.28)
$d\left(\frac{FDI^{inw}}{K}\right)$	-4.11 (9.08)	-9.48 (20.79)
$d\left(\frac{FDI^{out}}{K}\right)$	12.97*** (4.32)	7.39 (14.03)
g^{M2}		-15.00*** (4.51)
g^{M4}	13.11* (6.67)	
R^2	29.40%	14.74%
Wald F-Statistic	8.55***	3.82**
Sample	1997-2019	1997-2019

Note: Using $d\left(\pi/_{1+u}\right)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, and the growth rate of monetary aggregates M2 and M4. Since for the UK g^{M4} is I(1), the first difference of each time series is taken as regressor to avoid spurious regressions. The corresponding Newey-West HAC standard errors are in parentheses. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.

Table 4: Effect of Total Credit to Private Non-Financial Sector in Percent of GDP on the Inflation-Unemployment Trade-off in the US

	USA	
VARIABLES	(1)	(2)
Constant	-0.005 (0.098)	0.003 (0.069)
$d\left(\frac{FDI^{inw}}{K}\right)$	-0.204 (16.65)	
$d\left(\frac{FDI^{out}}{K}\right)$	2.89 (12.00)	
$d(g^{Credit})$	-2.26 (9.31)	-1.22 (8.33)
R^2	0.45%	0.12%
Wald F-Statistic	0.06	0.02
Sample	1997-2019	

Note: Using $d\left(\pi/_{1+u}\right)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, and the first difference of the growth rate of the "Total Credit to Private Non-Financial Sector in % of GDP" $d(g^{Credit})$for the US. The corresponding Newey-West HAC standard errors are in parentheses. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.

4.1 Role of Product Innovations and Process Innovations in the Euro Area

It is interesting to analyze the role of both product innovations and process innovations. Product innovations typically go along with a higher market-clearing price as the demand curve becomes steeper. The increase in the market price associated with better quality of goods should not be considered as inflation and a reduction of purchasing power, respectively. Moreover, product innovations could go along with rising mark-up rates; possibly in more sectors if there is a broader wave of product innovations which could raise the inflation rate. Particularly, this could happen if product innovations go along with a move of firms towards more price differentiation. Process innovations should dampen inflationary pressure. As regards survey results, one may use the data from the EU's Community Innovation Survey which, however, is available only every second year so that we used linear interpolation to get a full time series. For reasons that are unclear, the EU has stopped reporting the data after 2016.

The innovation data considered subsequently are I(2), so that changes of the growth rate of product innovations and process innovations are considered, respectively. The subsequent regression for the Euro Area (see Table 5) shows a significant coefficient for the process innovation rate which, however, raises the slope of the Phillips curve – as changes of the process innovation rate are considered, one may interpret the coefficient as indicating the effect of an accelerated process innovation race which raises resource scarcity in many critical sectors and therefore raises the slope of the Phillips curve. The regression coefficient for product innovation changes is negative, but not significant. The FDI variables are no longer significant, while the growth rate of the money supply for M3 is positive and significant. The adjusted R-squared is raised very strongly by the inclusion of the two innovation variables (from 16.6 percent in the regression without the innovation variables to 72.5 percent with). The fourth specification indicates that the driver of the increase of the R-squared is process innovation, which can explain about 78.4 percent of the variations of the inflation-unemployment ratio in the Euro Area.

Clearly, the short time series for the Euro Area is problematic and it is highly desirable that the European Commission would continue the Community Innovation Survey and the publication of the resulting data. Moreover, there is a broad statistical challenge for the OECD countries to collate similar data and one may hope that the OECD will push for a comprehensive approach covering product innovations and process innovations for all member countries in the near future.

Table 5: Product and Process Innovation Effects on the Inflation-Unemployment Trade-off in the Euro Area

	Specification			
Variables	(1)	(2)	(3)	(4)
Constant	-0.14 (0.07)	-0.19*** (0.04)	-0.07 (0.11)	-0.20*** (0.03)
$d\left(\frac{FDI^{inw}}{K}\right)$	0.67 (31.63)			
$d\left(\frac{FDI^{out}}{K}\right)$	1.46 (41.36)			
$d(g^{M3})$	5.95* (2.73)			
$d(I_{Product}, 2)$	-0.013 (0.011)	-0.015 (0.012)	-0.058 (0.049)	
$d(I_{Process}, 2)$	0.020** (0.006)	0.031*** (0.005)		0.033*** (0.003)
R^2	86.23%	79.66%	20.66%	78.41%
$\bar{R}^2$	72.46%	74.58%	11.84%	76.02%
Wald F-Statistic	122.10***	62.39***	1.39	151.82***
Sample	2006-2016			

Note: Using $d\left(\pi/_{1+u}\right)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, the first difference of the growth rate of monetary aggregate M3, the second difference of both product and process innovations. The corresponding Newey-West HAC standard errors are in parenthesis. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.

Source: Own calculations

4.2 Empirical Findings for the Role of Expected Inflation Pressure

The growth rate of the money supply minus the growth rate of the production potential is considered here to be a proxy for inflation pressure in the subsequent analysis where we drop the focus on the role of product innovations and process innovations. The degree of freedom is fairly low with the short time series available for the FDI stock variables. The inflation pressure variable (using M3 with respect to the money supply) is highly significant as the regression output in Table 6 shows, namely both for the Euro Area and the UK. As regards Sweden, the inflation expectation proxy (i.e., the growth rate of M3 minus growth rate of potential output) is significant at the five percent level and the inward FDI stock ratio reduces the inflation-unemployment trade off; this possibly reflects the role of additional FDI-related competition in Sweden as a small open economy. As regards the US, there is no significant influence of the monetary inflation pressure proxy considered here; M2 works somewhat

better than M3 which is unsurprising for the case of the US. The monetary inflation pressure proxy shows – again – a negative significant sign. The difference of the growth rate of total credit to the nonfinancial sector and the growth rate of the production potential – as an alternative measure for inflation pressure – also does little to explain the trade-off between inflation and unemployment in the US (see Table 8).

Table 6: Inflation Pressure Effect on the Inflation-Unemployment Trade-off for the Euro Area, Sweden, UK and US

	Country			
Variables	Euro Area	Sweden	UK	US
Constant	-0.03 (0.06)	-0.20 (0.14)	-0.05 (0.16)	0.56** (0.23)
$d\left(\frac{FDI^{inw}}{K}\right)$	38.64** (15.54)	-22.95*** (7.60)	-8.87 (11.27)	-6.76 (19.02)
$d\left(\frac{FDI^{out}}{K}\right)$	-31.35** (14.18)	14.67 (9.23)	12.83* (7.10)	6.21 (11.72)
$g^{M3} - g^{ypot}$	15.07*** (3.71)	6.50** (2.45)	5.87 (4.58)	-14.43** (6.15)
R^2	28.08%	29.90%	10.85%	14.85%
Wald F-Statistic	11.43***	20.18***	2.16	1.85
Sample	1997-2019	1997-2018	1997-2019	1997-2019

Note: Using $d\left(\pi/_{1+u}\right)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, and the difference between the growth rate of the money supply M3 g^{M3} and the growth rate of the potential output g^{ypot} as a proxy for inflation pressure. For the Euro Area and the UK, the first difference of each time series $g^{M3} - g^{ypot}$ is taken as regressor to avoid spurious regressions. The corresponding Newey-West HAC standard errors are in parentheses. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.
Source: Own calculations

Table 7: Inflation Pressure Effect on the Inflation-Unemployment Trade-off for the UK and US using M2 and M4

	COUNTRY	
VARIABLES	UK	US
Constant	-0.08 (0.19)	0.58** (0.23)
$d\left(\frac{FDI^{inw}}{K}\right)$	-3.86 (8.82)	-6.95 (18.96)
$d\left(\frac{FDI^{out}}{K}\right)$	13.05*** (4.14)	6.40 (11.69)
$g^{M2} - g^{ypot}$		-14.89** (6.28)
$g^{M4} - g^{ypot}$	13.28* (6.81)	
R^2	29.71%	15.59%
Wald F-Statistic	10.50***	1.88
Sample	1997-2019	1997-2019

Note: Using $d\left(\pi/1+u\right)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, and the difference between the growth rate of the monetary aggregate (M2 or M4) and the growth rate of the potential output g^{ypot}. For the UK the first difference of $g^{M3} - g^{ypot}$ is taken as regressor to avoid spurious regressions. The corresponding Newey-West HAC standard errors are in parenthesis. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.
Source: Own calculations

As regards the US, there is no significant effect of the FDI stock variables on the medium term inflation-unemployment trade-off on the one hand, on the other hand the long run Phillips curve is not affected by the growth rate of total credit to the private sector. This implies that the medium (and long run) Phillips curve in the US is vertical. An interesting question is whether or not key internet variables – such as internet density – have a significant effect on the inflation-unemployment trade-off. However, the internet variables are available for time series analysis only for a decade which is too short a time span to include the variable in the regression analysis for the US.

Table 8: Effect of the Growth Rate of Total Loans to the Private Sector Minus Growth Rate of Production Potential on the Inflation-Unemployment Trade-off in the US

	USA	
VARIABLES	(1)	(2)
Constant	-0.006 (0.110)	0.004 (0.080)
$d\left(\frac{FDI^{inw}}{K}\right)$	-0.17 (17.38)	
$d\left(\frac{FDI^{out}}{K}\right)$	3.69 (13.15)	
$d(g^{Credit} - g^{ypot})$	-3.71 (10.20)	-2.29 (8.78)
R^2	0.96%	0.41%
Wald F-Statistic	0.10	0.06
Sample	1997-2019	

Note: Using $d(\pi/1+u)$ as dependent variable, this table gives the estimated coefficients for the first difference of the FDI inward stock to capital stock ratio $d\left(\frac{FDI^{inw}}{K}\right)$, first difference of the FDI outward stock to capital stock ratio $d\left(\frac{FDI^{out}}{K}\right)$, and the first difference of the difference between the growth rate of the "Total Credit to Private Non-Financial Sector in % of GDP" g^{Credit} and the growth rate of the production potential g^{ypot} for the US. The corresponding Newey-West HAC standard errors are in parentheses. ***, ** and * display significance at the 1%, 5% and 10% level, respectively.
Source: Own calculations

5. Economic Policy Conclusions

There is clear empirical evidence that the medium term Phillips curve is influenced by both the inward FDI stock variable and the outward FDI stock variable in Europe, specifically the Euro Area, and to a weaker extent in the UK and Sweden; in Sweden, the inward FDI stock variable is significant, while in the UK the outward FDI stock is significant. Therefore FDI-related economic globalization dynamics affect the Phillips curve. The FDI impact is insignificant in the case of the United States.

In the case of the Euro Area, the outward FDI variable indicates an impact which amounts to a flattening of the Phillips curve while the inward FDI variable suggests a steepening effect of the slope of the Phillips curve in the medium term. The net effect of the two FDI variables could be positive or negative with respect to an overall flattening of the Phillips curve.[4]

As regards the Euro Area, the product innovation variable as well as the process innovation variable were significant variables which fit well with the suggested theoretical framework. It would be quite adequate for central banks in the Euro Area countries and the European Central Bank, respectively, to put pressure on the EU and Eurostat, respectively - namely, to publish more regularly data from the Community Innovation Survey.

[4] A Wald test, in which the sum of the two coefficients for the inward and outward FDI was tested to be zero, did not yield clear results with respect to the different specifications.

One may argue that the extent to which outward FDI brings about more lobbying in host countries for a stricter inflation control and thus from the international sphere a stronger pressure on the central bank in the host country, namely to adopt a stricter (relative) anti-inflation policy, could not be evaluated. Or, whether – as a separate or parallel influence – the presence of affiliates abroad raises labor productivity and thus unemployment rates via a positive supply-side effect. Here, additional research is required in the near future.

The analysis clearly suggests that foreign direct investment is crucial for understanding key macroeconomic variables such as the inflation rate and the unemployment rate; and thus also reinforces insights from new DSGE research. The OECD should urgently consider providing more data both on FDI – including sectoral FDI stock data – and on product innovations and process innovations as well.

As regards differences between the United States and Europe – read: the Eurozone and the United Kingdom plus Sweden – further research is necessary to investigate further the reasons for the varying findings for the US and the European economies. The US is less open than the Eurozone and the UK on the one hand, on the other hand the implicit Taylor rule governing US monetary policy might be less strict than in the Eurozone or the UK. Moreover, the dominant role of the US dollar in global international currency reserves markets could also indicate specific characteristics of the United States which in the end have an effect on the inflation-unemployment trade-off. Labor market institutions also matter where the US and the UK are characterized by a lower influence of trade unions than exists in the Eurozone countries. One may note that the Eurozone countries invest more public funding in training and retraining of workers – about 0.3% of GDP, while the figure for the US and the UK is close to zero – which should affect the ability of workers and companies, respectively, to cope with negative shocks. Finally, economic attitudes of workers and employees (concerning, for example, risks) in the countries considered might differ. Here, one may consider including findings of the World Value Survey in future research.

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Appendix

Table 9: Overview Statistics and Information about the Dependent Variable d(π/(1+u))

	$d\left(\frac{\pi_{EA,t}}{1+u_{EA,t}}\right)$	$d\left(\frac{\pi_{SW,t}}{1+u_{SW,t}}\right)$	$d\left(\frac{\pi_{UK,t}}{1+u_{UK,t}}\right)$	$d\left(\frac{\pi_{US,t}}{1+u_{US,t}}\right)$
Mean	0.0615	0.1028	-0.0779	0.0036
Median	0.0564	0.2041	0.0763	0.0863
Maximum	1.1991	1.2317	1.4296	0.8490
Minimum	-1.1577	-1.2899	-3.7837	-1.1069
Std. Dev.	0.5170	0.7306	1.0137	0.5843
Phillips-Perron test (p-value)	0.0011	0.0012	0.0000	0.0005
Sample	1997-2019	1997-2019	1997-2019	1997-2019
Observations	23	23	23	23
Source for inflation (GDP deflator)	OECD Annual National Accounts			
Source for unemployment rate	World Bank World Development Indicators			

Note: The Phillips-Perron test is conducted to test for stationarity assumption using Bartlett kernel with Newey-West automatic bandwidth selection. Here, MacKinnon (1996) one-sided p-values are displayed. The null hypothesis is that the time series is integrated of order 1 (has a unit root). For the unemployment rate, the last observation of the corresponding year is considered. Abbreviations: EA=Euro Area; SW=Sweden; UK=United Kingdom, US=United States; Std. Dev.=Standard deviation.

Table 10: Overview Statistics and Information about the Monetary Aggregate Time Series

	$d(g_{EA,t}^{M3})$	$g_{SW,t}^{M3}$	$d(g_{UK,t}^{M3})$	$g_{US,t}^{M3}$	$d(g_{UK,t}^{M4})$	$g_{US,t}^{M2}$
Mean	-0.0001	0.0699	-0.0062	0.0620	-0.0025	0.0620
Median	-0.0014	0.0502	-0.0009	0.0618	0.0022	0.0616
Maximum	0.0432	0.2478	0.0672	0.0863	0.0568	0.0866
Minimum	-0.0660	0.0161	-0.1036	0.0250	-0.1019	0.0247
Std. Dev.	0.0239	0.0577	0.0415	0.0152	0.0387	0.0152
Phillips-Perron test (p-value)	0.0045	0.0280	0.0001	0.0048	0.0000	0.0051
Sample	1997-2019	1997-2018	1997-2019	1997-2019	1997-2019	1997-2019
Observations	23	22	23	23	23	23
Sources	OECD Monthly Monetary and Financial Statistics				Bank of England	FRED, Federal Reserve Bank of St. Louis

Note: ´The Phillips-Perron test is conducted to test for stationarity assumption using Bartlett kernel with Newey-West automatic bandwidth selection. Here, MacKinnon (1996) one-sided p-values are displayed. The null hypothesis is that the time series is integrated of order 1 (has a unit root). The last observation of each year is taken into account. Abbreviations: EA=Euro Area; SW=Sweden; UK=United Kingdom; US=United States; Std. Dev.=Standard deviation.

Table 11: Overview Statistics and Information about the Inward FDI Ratio Time Series

	$d\left(\frac{FDI_{EA,t}^{inw}}{K_{EA,t}}\right)$	$d\left(\frac{FDI_{SW,t}^{inw}}{K_{SW,t}}\right)$	$d\left(\frac{FDI_{UK,t}^{inw}}{K_{UK,t}}\right)$	$d\left(\frac{FDI_{US,t}^{inw}}{K_{US,t}}\right)$
Mean	0.0026	0.0044	0.0043	0.0047
Median	0.0017	0.0004	0.0067	0.0066
Maximum	0.0147	0.0305	0.0232	0.0278
Minimum	-0.0147	-0.0282	-0.0402	-0.0188
Std. Dev.	0.0063	0.0157	0.0128	0.0099
Phillips-Perron test (p-value)	0.0000	0.0026	0.0031	0.0022
Sample	1997-2019	1997-2019	1997-2019	1997-2019
Observations	23	23	23	23
Source (FDI)	United Nations Conference on Trade and Development (UNCTAD)			
Source (capital stock)	Penn World Table 10.0			

Note: The Phillips-Perron test is conducted to test for stationarity assumption using Bartlett kernel with Newey-West automatic bandwidth selection. Here, MacKinnon (1996) one-sided p-values are displayed. The null hypothesis is that the time series is integrated of order 1 (has a unit root). Abbreviations: EA=Euro Area; SW=Sweden; UK=United Kingdom; US=United States; Std. Dev.=Standard deviation.

Table 12: Overview Statistics and Information about the Outward FDI Ratio Time Series

	$d\left(\frac{FDI_{EA,t}^{out}}{K_{EA,t}}\right)$	$d\left(\frac{FDI_{SW,t}^{out}}{K_{SW,t}}\right)$	$d\left(\frac{FDI_{UK,t}^{out}}{K_{UK,t}}\right)$	$d\left(\frac{FDI_{US,t}^{out}}{K_{US,t}}\right)$
Mean	0.0032	0.0043	0.0032	0.0033
Median	0.0041	0.0035	0.0012	0.0073
Maximum	0.0145	0.0303	0.0396	0.0198
Minimum	-0.0097	-0.0219	-0.0517	-0.0378
Std. Dev.	0.0058	0.0134	0.0220	0.0137
Phillips-Perron test (p-value)	0.0001	0.0338	0.0050	0.0000
Sample	1997-2019	1997-2019	1997-2019	1997-2019
Observations	23	23	23	23
Source (FDI)	United Nations Conference on Trade and Development (UNCTAD)			
Source (capital stock)	Penn World Table 10.0			

Note: Phillips-Perron test is conducted to test for stationarity assumption using Bartlett kernel with Newey-West automatic bandwidth selection. Here, MacKinnon (1996) one-sided p-values are displayed. The null hypothesis is that the time series is integrated of order 1 (has a unit root). Abbreviations: EA=Euro Area; SW=Sweden; UK=United Kingdom; US=United States; Std. Dev.=Standard deviation.

Table 13: Overview Statistics and Information about the Inflation Pressure Time Series

	$d\left(g_{EA,t}^{M3} - g_{EA,t}^{ypot}\right)$	$g_{SW,t}^{M3} - g_{SW,t}^{ypot}$	$d\left(g_{UK,t}^{M3} - g_{UK,t}^{ypot}\right)$	$g_{US,t}^{M3} - g_{US,t}^{ypot}$	$d\left(g_{UK,t}^{M4} - g_{UK,t}^{ypot}\right)$	$g_{US,t}^{M2} - g_{US,t}^{ypot}$

Mean	0.0003	0.0463	-0.0056	0.0381	-0.0019	0.0381
Median	-0.0003	0.0290	0.0001	0.0385	0.0037	0.0383
Maximum	0.0399	0.2175	0.0673	0.0692	0.0573	0.0698
Minimum	-0.0600	-0.0114	-0.1042	0.0095	-0.0973	0.0092
Std. Dev.	0.0227	0.0561	0.0417	0.0157	0.0385	0.0156
Phillips-Perron test (p-value)	0.0031	0.0240	0.0001	0.0072	0.0000	0.0069
Sample	1997-2019	1997-2018	1997-2019	1997-2019	1997-2019	1997-2019
Observations	23	22	23	23	23	23
Sources (monetary aggr.)	OECD Monthly Monetary and Financial Statistics				Bank of England	FRED, Federal Reserve Bank of St. Louis
Source (potential output)	OECD Economic Outlook No 107					

Note: The Phillips-Perron test is conducted to test for stationarity assumption using Bartlett kernel with Newey-West automatic bandwidth selection. Here, MacKinnon (1996) one-sided p-values are displayed. The null hypothesis is that the time series is integrated of order 1 (has a unit root). Abbreviations: EA=Euro Area; SW=Sweden; UK=United Kingdom; US=United States; Std. Dev.=Standard deviation.

Table 14: Overview Statistics and Information about the Product and Process Innovation Time Series for the Euro Area

	$d(I_{Product}, 2)$	$d(I_{Process}, 2)$
Mean	3.6751	0.2756
Median	0.0000	0.0000
Maximum	27.9156	5.7253
Minimum	-23.5808	-7.4808
Std. Dev.	12.8763	3.7747
Phillips-Perron test (p-value)	0.0167	0.0455
Sample	2006-2016	2006-2016
Observations	11	11
Source	European Commission Community Innovation Survey	

Note: The Phillips-Perron test is conducted to test for stationarity assumption using Bartlett kernel with Newey-West automatic bandwidth selection. Here, MacKinnon (1996) one-sided p-values are displayed. The null hypothesis is that the time series is integrated of order 1 (has a unit root). Abbreviations: EA=Euro Area; SW=Sweden; UK=United Kingdom; US=United States; Std. Dev.=Standard deviation.

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