Beyond Monetary Credibility: the impact of globalisation on the output-inflation trade-off in euro-area countries[1]

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Abstract

This paper studies the impact of globalisation on cross-country variation in the degree of price stickiness, where the latter is approximated by the slope of the New Keynesian Phillips Curve (NKPC). Whilst most of the analyses of this kind derive price rigidity from à la Calvo (1983) contracts, we assume nominal rigidity as a function of the share of (pre-determined) intermediate inputs in production (Blanchard 1983), whether domestically produced or imported. Because intermediate goods prices tend to be sticky (Stigler and Kindahl 1970; Carlton 1986) or, at least, less pro-cyclical than the price of labour (Basu 1995), countries that take part in international production chains should be characterised by greater price stickiness than relatively less integrated economies. Cross-section estimates of 6 euro-area countries over 1970-2006 support the main predictions of the model. The policy implications are immense. Globalisation and the arguably related rise in international fragmentation is producing a flattening of the Phillips Curve, with the result that demand management should have stronger real effects than it did earlier, especially now that inflation expectations have been anchored, as it might be the case for the euro-zone.

JEL Classification: E3, E4, E5, F4, F15.
Keywords: New Keynesian Phillips Curve; price stickiness; international fragmentation.

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Introduction

This paper studies the impact of globalisation on cross-country variation in the degree of price stickiness, where the latter is approximated by the slope of the Phillips Curve. Globalization is taken to indicate the progressive rise in the share of intermediate to total inputs in production, whether domestically produced or imported. Because intermediate goods prices tend to be sticky (Stigler and Kindahl 1970; Carlton 1986) or at least less pro-cyclical than the price of labour (Basu 1995), countries whose production system is very much integrated with the rest of the world economy should be characterised by relative price rigidity, or, differently put, by a flatter Phillips Curve than more closed economies.

The theoretical approach builds on the New Keynesian Phillips Curve (NKPC) in that it is assumed that an exogenous demand shock alters real marginal costs and, through them, the producer desired price and thus possibly inflation. Against this framework, price setting is viewed as “the product of optimisation by monopolistically competitive firms subject to constraints on the frequency of price adjustment” (Gali, Gertler and Lopez-Salido 2001, 5). Most of the available studies assume rigidities in nominal price setting due to *à la Calvo* (1983) contracts (Galì, Gertler and Lopez-Salido 2001; Rumler 2007; Sbordone 2007; Guerrieri et al 2008), meaning that producers change output prices at random intervals of time. We depart from this specification and posit that price rigidity or limited flexibility is the result from the presence of predetermined prices (i.e. intermediate goods prices), as originally formulated by Blanchard (1983).

The issue of the relationship between openness, whatever its definition, and the output-inflation trade-off is an extremely complex one. Not only do empirical analyses

produce conflicting results, but there is also ambiguity about the theoretical assumptions.

Standard open economy models suggest, for example, a positive relationship between openness and price flexibility. The explanation is that a positive monetary shock that boosts import demand leading to real exchange rate depreciation is more likely to translate into an acceleration of inflation rather than into real output gains, the higher the level of openness to trade. This mechanism implies a steeper Phillips Curve in relatively more open economies (Dornbusch 1976; Obstfeld and Rogoff 1996). Rogoff (2003) reaches a similar conclusion in that he argues that stronger competitive pressures from abroad make prices more flexible, which indeed steepens the Phillips Curve. This interpretation is in line with sectoral studies confirming that increased openness reduces mark-ups (Chen, Imbs and Scott 2004). Few New Keynesian studies achieve comparable results. Rumler (2007) finds that the rise in international competitive pressures has come with a steepening of the NKPC in 9 European countries over 1980-2003. His argument is as follows: because more open economies generally import greater amounts of intermediate goods than relatively closer economies and because the price of imported inputs tends to be more variable than that of domestic labour as well as of domestically produced intermediate goods, firms in more open economies should change prices more frequently than elsewhere.

At the other extreme are studies for which openness implies a flatter Phillips Curve, namely relative price rigidity. Borio and Filardo (2007) argue that globalisation has reduced the sensitivity of prices to domestic economic conditions, thereby accounting for a flatter Phillips Curve. Using a sample of 16 OECD countries over 1985-2005, they find that global measures of economic activity such as foreign output gaps and the deviation of import prices from the Consumer Price Index

(CPI) have become more relevant than domestic factors in explaining inflation starting with the 1990s to coincide indeed with the greater internationalisation of production. An IMF study (2006) provides for a similar result using the share of non-oil trade in GDP as an indicator of openness. A majority of New Keynesian studies of the relationship between openness and inflation support the hypothesis that globalisation comes with greater nominal rigidity. The underlying argument is that stronger competitive pressures from abroad induce firms to leave prices unchanged after a shock so as not to loose customers to the competition. Reinforcing this view are survey-based data, according to which firms in the euro-area take decisions on prices with an eye at competitive conditions in the market in which they operate (Alvarez et al 2006)[2]. Guerrieri et al (2008) confirm this reading by demonstrating that foreign competition exercises a tangible impact on traded goods inflation because it reduces the desired mark-ups of domestic firms. Binyamini and Razin (2007) prove a similar point theoretically showing that, when producers produce indifferently for the domestic and the foreign market, as in more open economies, changes in output should not necessarily push the marginal costs slope upwards due to decreasing returns to scale with the result that, given constant marginal costs, the producer desired price will also remain unaltered.

For others the relationship between openness and the degree in price rigidity is just unclear. Temple (2002) does not find any systematic relationship between levels of openness to trade and the sacrifice ratio, which he uses as an alternative measure of the slope of the Phillips Curve just as in Ball (1994). Wu and Lin (2007) find that models without constant constraint do not show a direct and regular relationship between openness and inflation confirming that inflation is probably the

[2] Blinder et al (1998) finds the same results for US-based firms.

result of some other country-specific factors. Obstfeld and Rogoff (1996) themselves recognise that the exchange rate effects of monetary policy shifts described in the standard Mundell-Flemming open economy model are quite unclear and not always supported by the data. Using a New Keynesian perspective, Sbordone (2007) applies an extended version of Calvo-type price setting, where but the elasticity of demand is not constant but rather it changes depending on the relative market share of the differentiated goods. She concludes that the impact of foreign competition on the slope of the NKPC is far from clear. Ball (2006) generally criticises the hypothesis that an aggregate demand shock that raises marginal costs is not followed by inflation since this implies that one should find evidence of counter-cyclical movements in mark-ups (see also Kohn 2006).

This paper speaks to the rich debate about the likely impact of openness on the output-inflation trade-off, but it is also an attempt to offer a contribution to the empirical modelling and estimation of the functional form of the Phillips Curve under globalisation.

The empirical analysis is conducted on a sample of 6 European countries over 1970-2006 with special emphasis being placed on inflation dynamics under the EMU regime. The justification for the sample choice is threefold. First, if cross-country variation in price rigidity persists even once inflation expectations have been securely anchored, as in EMU, then it is possibly true that the output-inflation trade-off is influenced by factors other than monetary policy[3], and here

[3] A large amount of literature suggests that the vastly documented recent flattening of the Phillips Curve depends upon changes in monetary policy regimes more than anything else (Williams 2006; Roberts 2006; Boivin and Giannoni 2006; Smets and Wouters 2007). The reason is twofold. First, the worldwide success of central bank independence had the effect of anchoring inflation expectations thereby softening the link between changes in output (or in the output gap) and in domestic inflation. Second, monetary policy has generally become more reactive to cyclical fluctuations with the

globalization seems like an appropriate candidate explanation. Second, because in EMU most of the exogenous demand shocks are common to all member countries, be it a change in the interest rate by the European Central Bank (ECB) or the size of the fiscal stimulus under pressures to comply with the Stability and Growth Pact (SGP), cross-country differences in price rigidity that persist even after the establishment of a common inflation targeting system imply that EMU has strong distributional effects. Third, the globalisation processes has proceeded hand in hand with the intellectual success of liberalist economic theories and of monetarism with its belief that government action is at the root of inflation. Paradoxically, the internationalisation of production has but strengthened the case for more active demand management to the extent that this should produce real effects in the short to medium-run now that inflation expectations have been anchored, as it might be the case for the euro-area.

The rest of the paper is structured as follows. Section I offers some indicative evidence on the importance of intermediate to total inputs in production and on its relationship with price stickiness. Section II presents the baseline model. Section III describes the result from the extended empirical analysis. Section IV concludes.

Globalisation and the output-inflation trade-off

Globalisation is here taken to indicate the rise in the share of intermediate to total inputs in production, whether domestically produced or imported. The increasing importance of intermediate goods in production processes certainly derives from the triumph of the paradigm emerged at the beginning of the previous century, for

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result that the inflationary impact of excessive demand pressures is often offset by monetary contractions.

which roundabout production delivers stronger increasing returns than in-line production (Young 1928). Nevertheless, we posit that it is the internationalisation of trade that has created opportunities for firms to produce larger shares of intermediate relative to final goods, which they can subsequently export, whilst simultaneously allowing them to expand the shares of intermediate goods in total imports.

We use the term “domestic fragmentation’ to describe the former aspect, namely the fact that, under globalisation, countries are producing more intermediate than final goods. The empirical evidence in favour of this hypothesis is quite strong. Graphs 1-6 show the evolution of the industrial production price index and of the intermediate goods production index over 1970-2006 in six European countries (see Appendix). In most of them, the production of intermediate goods represents the largest part of production in total manufacturing with excesses possibly being exported to trade partners (e.g. Italy). There is thus no doubt that intermediate inputs in production are gaining in importance. Just as an indication, in 1995, the share of intermediate goods in national production had reached a substantial median of 57% across all OECD countries.

We use the term “international fragmentation” to account for the latter aspect, namely that, under globalisation, a large portion of a country’s imports tends to consist of intermediate inputs. Also in this case the empirical evidence is robust and almost uncontroversial. Hummels et al (1998) and Kleinert (2003) confirm that at present international trade concerns more and more intermediate rather than final goods.

For descriptive purposes only, we measure the country-specific degree in price stickiness by looking at the relative volatility in the adjusted real output. The

approach is indebted to Gordon (1981). We assume that the analysed demand-driven exogenous shock is represented by a change in the log of nominal GDP (y_n). By definition, such a shock must be divided between a price component (p) and a real-GDP component (y_r) both given in logs:

$$y_n = p + y_r \qquad (1)$$

Equation (1) states simply that any change in nominal GDP must be divided between a change in the aggregate price level and a change in real GDP. More precisely, we assume that the former is always equivalent to a constant fraction (a) so that the latter equals to ($1-a$):

$$y_n = ap + (1-a)y_r \qquad (2)$$

We further subtract from both sides of equation (2) the growth rate of trend real GDP and, to simplify the notation, just add a "hat" to variables defined net of trend real output:

$$\hat{y}_n = ap + (1-a)\hat{y}_r \qquad (3)$$

According to equation (3), over the short-term ($\hat{y}_r \neq 0$), any change in nominal GDP must be accompanied by some price adjustment of coefficient a and some real output fluctuation that is greater, the lower the value of a. The estimation of the coefficient of gradual price adjustment (a) can thus take the following alternative two forms:

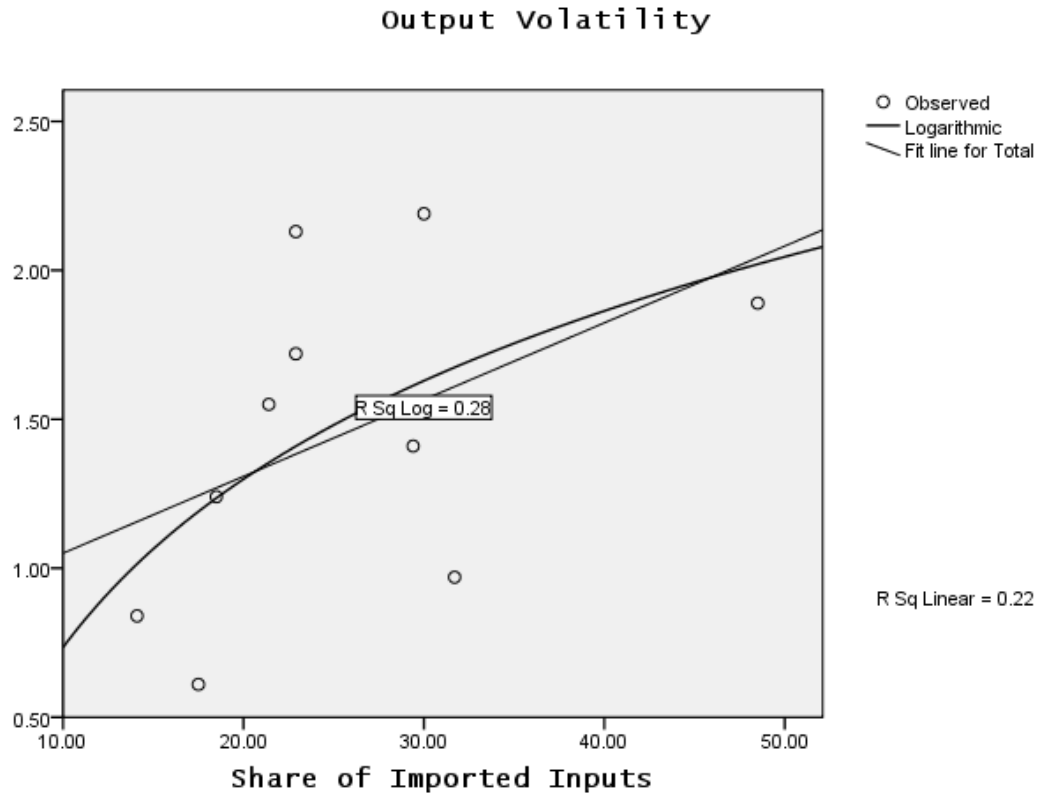
$$p = a\,\hat{y}_n \qquad (4)$$

$$\hat{y}_r = (1-a)\hat{y}_n \qquad (5)$$

By implication, great output volatility is indicative of price stickiness. This is so provided that (i) the change in nominal GDP is assumed exogenous; and if not, that (ii) non-labour income is not large enough to offset a change in nominal GDP; or that (iii) firms are not able to fully react to demand shocks by mere work-sharing (see Gordon 1981, 498). All of these assumptions are plausible in this research context. Firstly, we have indeed assumed that the change in nominal GDP is the only transmitter of demand shocks produced either by monetary or fiscal authorities, hence fully exogenous. Secondly and assuming that full exogeneity is not necessarily a real-world scenario, given that the share of labour is about the same across all core EU member states and that work-sharing is the exception rather than the norm in highly institutionalised labour markets such as those of the EU, cross-country differences in output volatility can be well said to result almost entirely from differences in price rigidity.

Having taken real output volatility as a measure of the degree in price stickiness, we relate the standard deviation in the gap between actual and trend GDP at 2000 prices with the share of imported inputs in total costs as calculated by Campa and Goldberg (2006). The data refer to the EMU period. Figure 1 represents the curve estimation. The general indication is that the stronger the reliance on external markets for the acquisition of intermediate inputs, the greater price rigidity ($R^2 \log 0.28$).

Fig.1 Output Volatility and Imported Input Share, EMU



Source: author's own calculations based on AMECO Database and data on imported input shares from Campa and Goldberg (2006).

The baseline model

Our baseline model consists of a very simplified version of the open economy NKPC. The standard formalization of the NKPC foresees that only a fraction $(1-q)$ of firms is able to reset their price, whilst all other firms keep it unchanged. They do so by choosing a price p_t that minimises the following loss function:

$$\min E_{t-1}\sum_{k=0}^{\infty}(qb)^{k}(p_t - p_{t+k}*)^2 \qquad (6)$$

where E_{t-1} denotes expectations formed on the basis of information available in $t-1$; the term $E_{t-1}(p_t - p_{t+k}*)^2$ describes the expected loss in profits at time $t+k$, which derives from the fact that firms are unable to set an optimal price due to the presence of frictions (or rigidities); it is a quadratic function so as to approximate a general profit function; b is a discount factor suggesting that firms put less weight on future than on today's losses; finally, the summation term suggests that firms consider the implications of the price set today for all future periods.

Equation (1) implies a solution of the following form:

$$p_t = (1-qb)\sum_{k=0}^{\infty}(qb)^k E_t p*_{t+k} \qquad (7)$$

The term p_t* denotes the log of the optimal price, namely the static equilibrium price in the absence of any form of rigidity. By definition, this is given by:

$$p_t* = m_t * mc_t \qquad (8)$$

where $m*$ is the log of the optimal mark-up, namely the static equilibrium mark-up in the absence of any form of rigidity and mc_t is the log of nominal marginal costs. It should be noted that $m*$ is a decreasing function of the elasticity of demand or degree of product market competition (h_t):

$$m* = \left(1 - \frac{1}{h_t}\right)^{-1} \qquad (9)$$

Assuming a Cobb-Douglas production function of the form $Y = AN^a$, the term mc_t can be rewritten as:

$$mc_t = \left(\frac{1}{a}\right)\frac{w_t n_t}{y_t} \qquad (10)$$

Objective (1) is subject to demand conditions; these are a decreasing function of the relative price of each firm and an increasing function of the level of aggregate demand given by the consumption of domestic final goods, of internationally produced final goods, of domestic intermediate goods and of imported intermediate goods:

$$y_t = \left(\frac{p_i}{p}\right)^{-h}\left(c + c^* + m + m^*\right) \qquad (11)$$

Equation (5) explicitly introduces open economy factors. When accounting for the fact that domestic firms employ not only domestic labour[4] but also intermediate goods, both domestically produced and imported, we obtain the following new definition of nominal marginal costs:

$$mc_t = \left(\frac{1}{a}\right)\frac{w_t n_t}{y_t}\frac{p_t i_t}{y_t}\frac{p_t i_t^m}{p_t i_t / y_t} \qquad (12)$$

where $\frac{p_t i_t}{y_t}, \frac{p_t i_t^m}{p_t i_t / y_t}$ are respectively the nominal share of domestic intermediate goods and imported intermediate goods in production.

[4] We assume that there is no international labour mobility.

From equation (7) we calculate the first-order stochastic difference equation to obtain after a series of re-arrangements:

$$p_t = bE_t p_{t+1} + \frac{(1-q)(1-qb)}{q}(m + mc_t - p_t) \qquad (13)$$

The term $(m + mc_t - p_t)$ represents real marginal costs, which according to equation (12) can be also re-written as:

$$rmc_t = \frac{w_t n_t}{p_t y_t} \frac{p_t i_t}{p_t y_t} \frac{p_t i_t^m}{p_t i_t / p_t y_t} \qquad (14)$$

One point of departure from the price rigidity specification described in equation (1) is that $(1-q)$ is not the fraction of firms that is able to reset the price and q the share of firms that is unable to change output prices due to the presence of à la Calvo (1983) contracts. Rather, $(1-q)$ is the fraction of firms that can easily target the optimal price because they do not use intermediate goods, neither domestically produced nor imported, whilst q is the remaining population of national firms, which is subject to nominal rigidities due to the incidence of pre-determined prices in their individual production function. Not dissimilarly from the original specification (see Blanchard 1983), by predetermined prices we mean domestic as well as imported intermediate goods prices. By implication, the greater the share of intermediate inputs in production, whether domestically produced or imported, the greater the value of q and hence also the degree of price stickiness.

To our knowledge, there is no systematic analysis of the NKPC with predetermined prices. Blanchard's model

consists of the formalization of an intuitive and persuasive way of thinking of possible explanations for price rigidity. The general idea is that price stickiness rises in the number of price decisions or stages of production. The reason for the recent benign neglect of the chain-of-production model suggested by Blanchard is twofold.

First, the model assumed in-line production, whilst today's is mainly of a roundabout nature. However, we suggest that the postulation of in-line production derives from a narrow reading of the original model or, better, that the latter can still be employed based on input-output tables rather than on a simple linear chain of production. A similar idea is implicit in Gordon (1990), where the author stresses "the role of the input-output table in translating prompt price adjustment at the individual level to gradual price adjustment at the aggregate level" (p.1152).

Second, the chain-of-production model is difficult to test empirically. It is not the same as saying that the prices of intermediate goods adjust faster than that of final goods. In fact, if an exogenous demand shock affects first the demand for final goods and only later that of intermediate goods, we would see the prices of the former adjusting faster than the prices of the latter (Blinder et al. 1998, 199). We propose a method of approximating the average number of price decisions in an economic system. As from the definition offered above, an economy in which intermediate goods production outweighs final goods production is said to be characterised by a high degree of domestic fragmentation. We argue that, in domestically fragmented economic systems, there is a relatively higher number of price decisions, hence greater price stickiness, than in less fragmented systems. This intuition is confirmed by results in Rumler (2007), who shows that the degree of price rigidity rises when the model that is estimated includes domestically

produced intermediate goods, besides imported ones. We also argue that the number of price decisions further increases and, with it, the degree of price rigidity, if a large share of the used (not produced) intermediate inputs is imported.

An alternative and vastly used price rigidity specification is based on menu costs (Mankiw 1985). The core argument builds on the following loss function:

$$p\left(p^{*}\right)-p\left(p\right)\approx p^{'}\left(p^{*}\right)\left(p^{*}-p\right)-\frac{1}{2}p^{''}\left(p^{*}\right)\left(p^{*}-p\right)^{2} \qquad (15)$$

where p^{*} is the profit-maximising price and p is the initial output price. Because the first derivative of equation (1) is 0, the profit loss is second order. More precisely, the costs from non-adjustment are smaller, the closer the firm's predetermined price to the profit maximising price. Given that the profit-maximising price is a function of the size of the demand shock, the size of the shock crucially determines the opportunity to change output prices. In this respect, this specification is not apt to explain the cross-country variation in price stickiness in EMU given that here demand shocks are of approximately the same size, and so should be the costs from non-adjustment.

In light of the elements of the model laid down above, we estimate the following equation:

$$p_{t}=a_{1}p_{t+1}+a_{2}rmc_{t}+e \qquad (16)$$

where p_{t+1} is the log expected inflation, which we imagine being a function of the current output gap, and rmc_{t} is the log change in the share of labour, domestic and imported intermediate inputs in GDP.

Extended empirical analysis

We conduct the empirical analysis on a sample of 6 euro-zone countries including Belgium, Germany, Ireland, France, Italy and Austria using annual data over the period 1970-2006. The dependent variable is given by the log change of the GDP deflator (AMECO database). Future expected inflation is approximated by the current output gap, where the latter is measured as the log change in the difference between real GDP at 2000 prices and trend GDP at 2000 prices (AMECO database). Changes in real labour marginal costs are approximated by the change in the labour share (in logs) indeed because we have assumed a Cobb-Douglas production function. As anticipated above, real marginal costs include besides labour costs also the real cost of domestically produced and imported intermediate goods. We thus need to find a measure for the intermediate input share and for the imported intermediate input share. As concerns the former, we do so by calculating the difference between the yearly rate of change in total industrial production and the yearly rate of change in intermediate inputs production, using for both the 2000 index (EUROSTAT Database). This is our measure of domestic fragmentation. On the other hand, the imported intermediate input share is captured by a dummy with values of 0 for countries that produce their own intermediate inputs and of 1 for countries that import the majority of the intermediate inputs used in production. This is our measure of international fragmentation. The distribution of the dummies 0,1 is based on data available in Campa and Goldberg (2006).

Table 1 presents the results[5]. Model (1) represents the estimation in its most complete form. The rate of inflation expected in the following period, which is here approximated by the log change in the current output gap, confirms very significant with an important coefficient

[5] Model (1), (2), and (3) do not contain a constant term given that we have incorporated a dummy.

of 0.61, a result that is comparable to those obtained from more sophisticated GMM estimations (see Batini et al 2005). The labour share is not statistically significant when taken in isolation. This confirms the recently voiced doubts about the capacity of the NKPC to predict actual inflationary pressures (Galì and Gertler 1999). Nevertheless, real marginal labour costs become significant when interacted with some measure of fragmentation in production, be it domestic or international fragmentation. In interaction with our measure of domestic fragmentation, the New Keynesian indicator of inflation appears significant and displays a coefficient of 0.40. The fact that this latter coefficient is lower than the coefficient on the output gap (0.61) should indeed suggest that high shares of intermediate inputs in production limit firms' capacity to adjust prices in response to a shock that possibly shift the marginal labour costs curve upwards. Most interestingly, the triple interaction term that includes the labour share, domestic as well as international fragmentation appears with an even larger negative coefficient of 0.46. The fact that this is negatively signed provides support to the main prediction of the model, namely that highly fragmented production systems display greater price rigidity then less fragmented ones or, differently put, are characterised by a relatively flatter Phillips Curve.

Model (4) uses the most traditional definition of globalization. Openness is measured as the propensity of each country to import, i.e. share of imports in GDP. The overall model provides much weaker results than model (1). Most importantly, the interaction term between the labour share and openness is not statistically significant nor is openness a crucial variable given the zero coefficient. This may be related to the fact that openness is here treated as exogenous, even if it is now generally recognised that it is an endogenous variable. (Romer 1993). Nevertheless, this does not exclude the

possibility that openness is just in itself a bad approximation of globalization, not least because in a New Keynesian world it requires anti-cyclical mark-ups.

In order to make also a contribution to the debate about the explanatory power of the NKPC relatively to the traditional (output-gap-based) PC, we further estimate the traditional PC and the pure NKPC departing from our hybrid specification[6]. Model (2) estimates the traditional Phillips Curve. The output gap is significant and bears a fairly large coefficient. Yet, the interaction term between the output gap and our measure of domestic fragmentation appears with a more modest coefficient of 0.23. On the other hand, model (3) estimates the pure NKPC. When interacted with the variable for domestic fragmentation, real marginal costs are a more convincing explanation than the output gap. Similarly, the triple interaction term is significant only when calculated on the labour share delivering a negative coefficient of 0.41 that is indeed indicative of a high degree of price stickiness.

[6] Ours can be regarded as a hybrid NKPC because it includes the output gap together with real marginal costs (Galì and Gertler 1999).

Table 1. The impact of globalization on slope of the
New Keynesian Phillips Curve – Panel data, OLS estimations (1970-2006)

	Model (1)	Model (2)	Model (3)	Model (4)
Constant				0.03 (0.00)***
?logY	0.61 (0.21)***	0.53 (0.20)***		0.42 (0.15)***
?logSL	-0.14 (0.22)	-0.00 (0.00)	-0.05 (0.22)	0.32 (0.29)
Dom. Fram.	0.002 (0.00)***		0.002 (0.00)**	
?logSL * Dom. Fram.	0.40 (0.20)**		0.38 (0.21)**	
?logY * Dom. Fram.		0.23 (0.06)***		
Int. Fram. (dummy)	0.02 (0.00)***	0.02 (0.00)***	0.02 (0.00)***	
?logSL * Dom. Fram. * Int. Fram.	-0.46 (0.23)**		-0.41 (0.24)*	
?logY * Dom. Fram. * Int. Fram.		-0.14 (0.09)		
Openness				-0.00 (0.00)***
?logSL * Openness				-0.005 (0.00)
N. observations	215	215	215	222
Adjusted R^2				0.12

Key: Standard errors in parentheses.

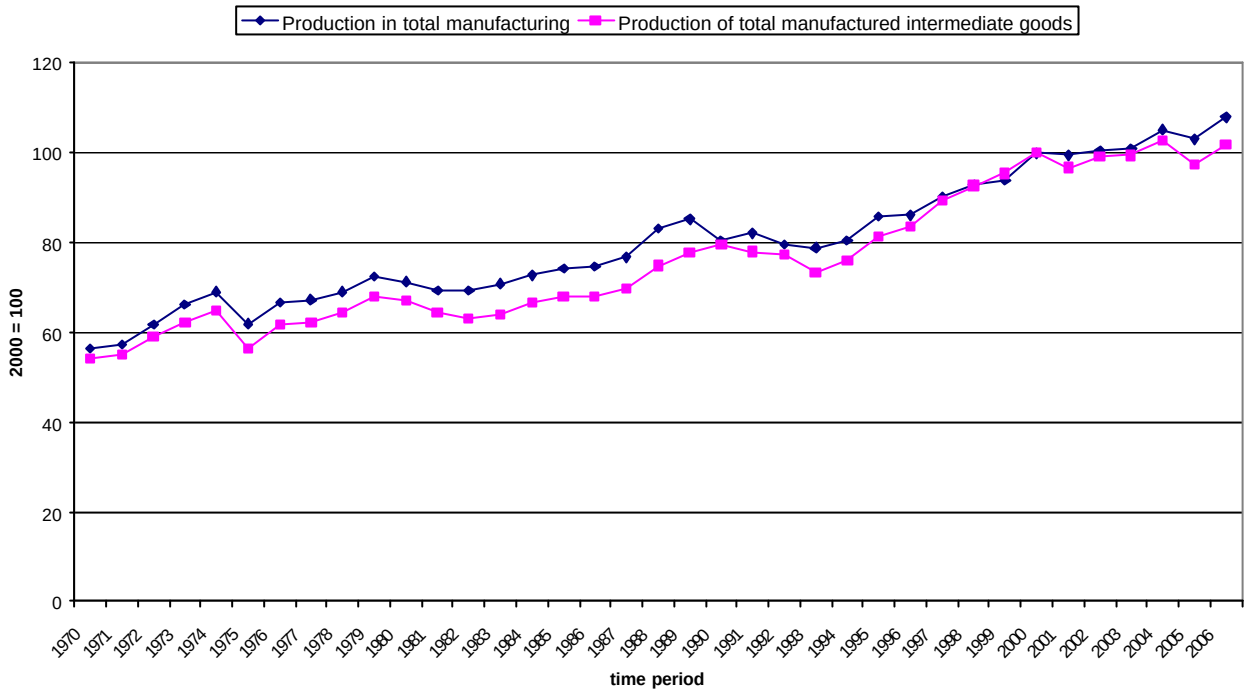
*** = significance at 1%; **= significance at 5%

Conclusions

This paper has analysed the impact of globalisation on the output-inflation trade-off or, differently put, on the slope of the Phillips Curve. Whilst most of the available literature equates globalisation with enhanced product market competition, we prefer a more qualitative definition of the internationalisation process, namely the participation of each individual country in the international production chain, which is here approximated by the size of the share of intermediate inputs in production, whether domestically produced or imported. The incentive for using a measure of globalisation alternative to stronger product market competition is that the latter unrealistically implies counter-cyclical mark-ups. We find that real marginal costs anticipate inflation only when interacted with a measure of domestic and/or international fragmentation. Indirectly, we thus suggest that only the open economy NKPC is a good indicator of inflationary pressures. The data support the following prediction of the model: countries with more fragmented production systems are characterised by greater price stickiness than less integrated economic systems. The policy implications are immense. The globalisation processes has proceeded hand in hand with the intellectual success of liberalist economic theories and of monetarism with its belief that government action is at the root of inflation. Paradoxically, the internationalisation of production has but strengthened the case for more active demand management to the extent that this should produce real effects in the short to medium-run now that inflation expectations have been anchored, as it seems to be the case for the euro-area.

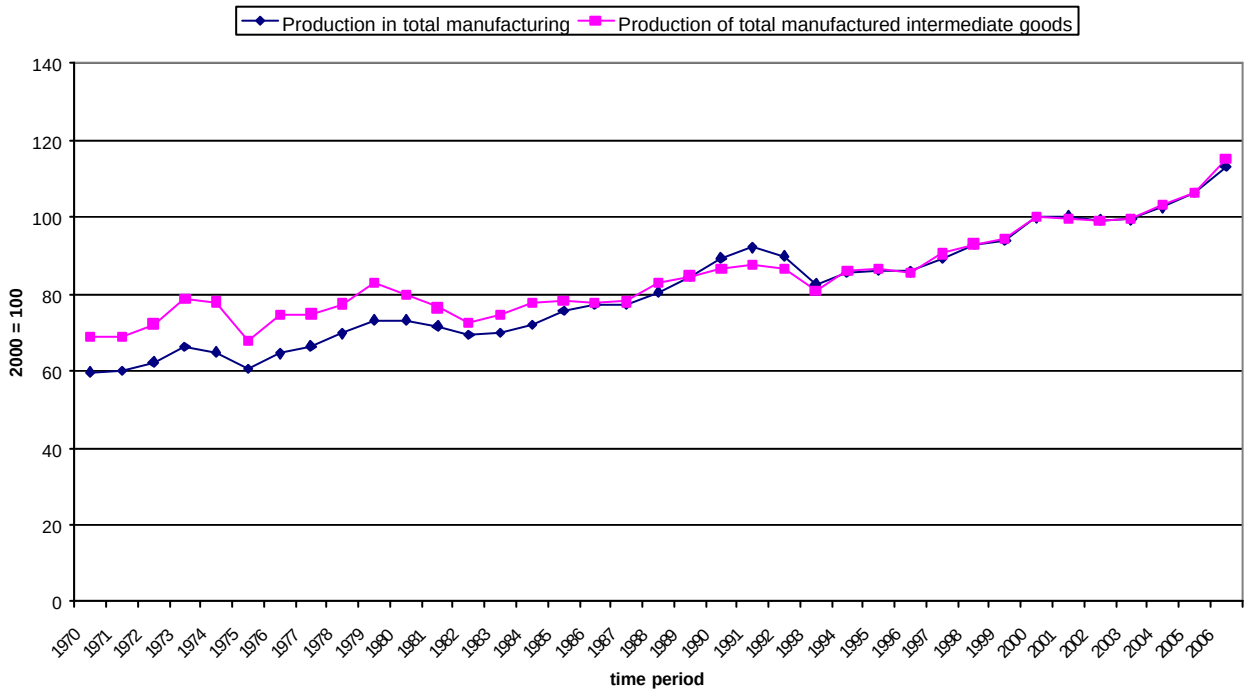
Appendix

Graph 1. Belgium: production of final and intermediate goods 1970-2006



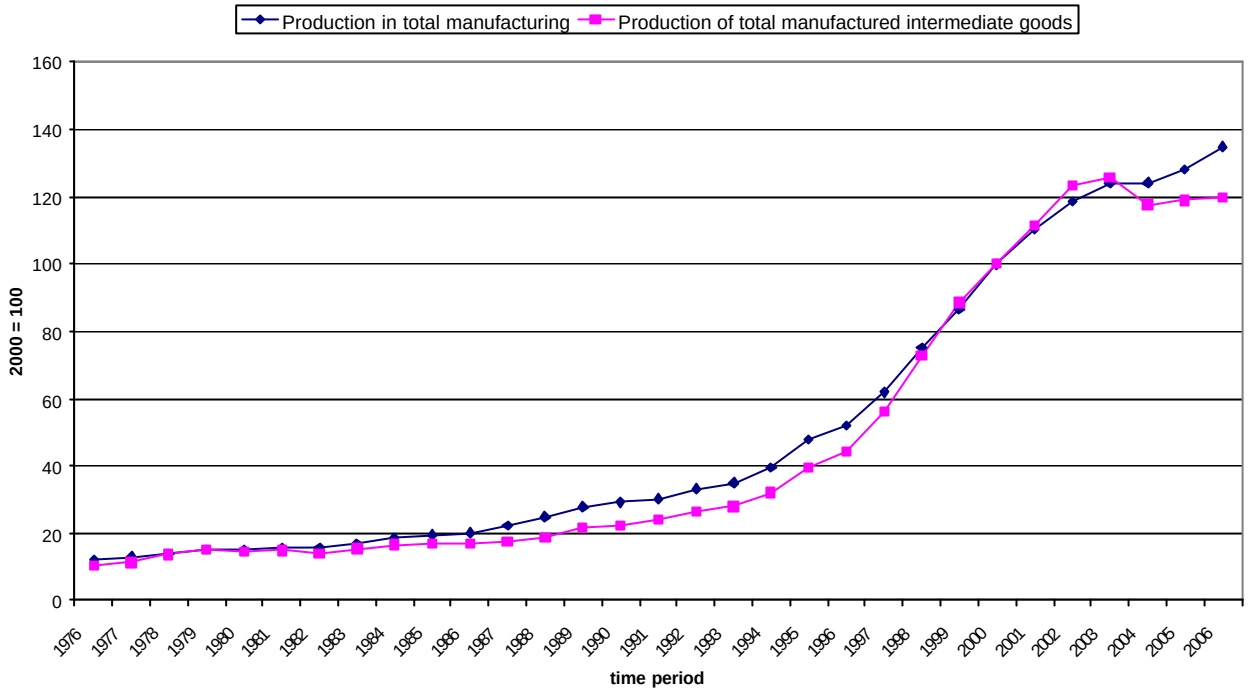
Source: EUROSTAT Database.

Graph 2. Germany: production of final and intermediate goods 1970-2006



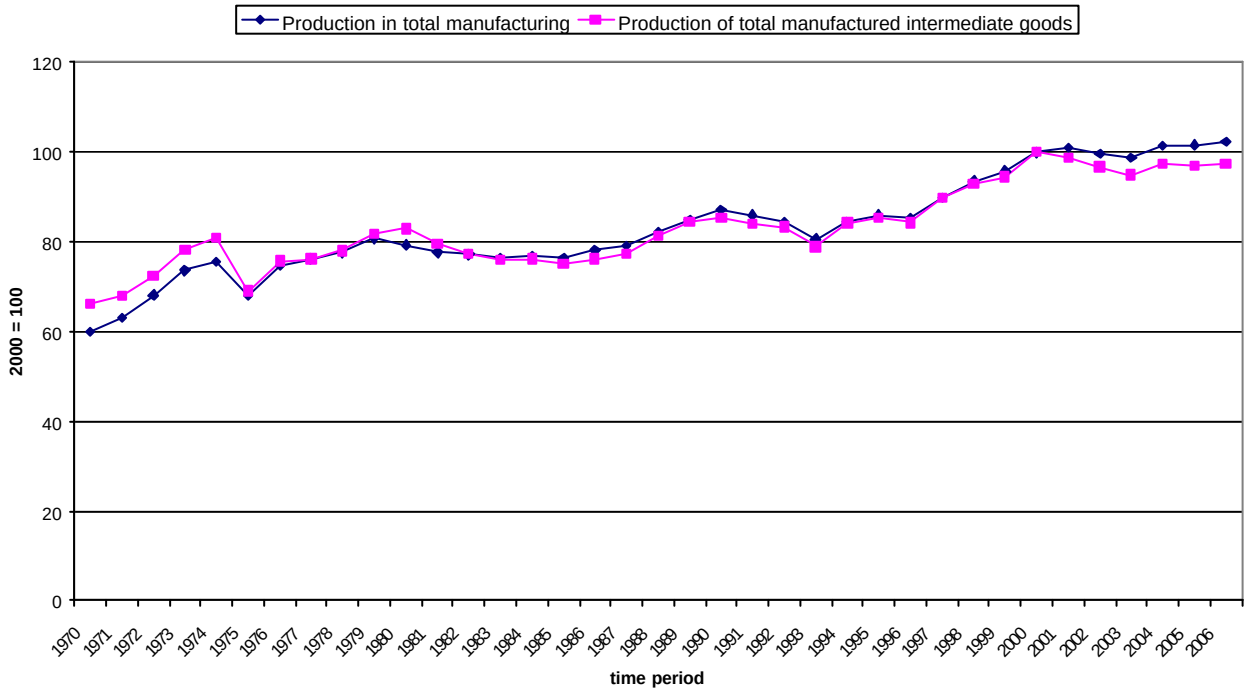
Source: EUROSTAT Database.

Graph 3. Ireland: production of final and intermediate goods 1976-2006



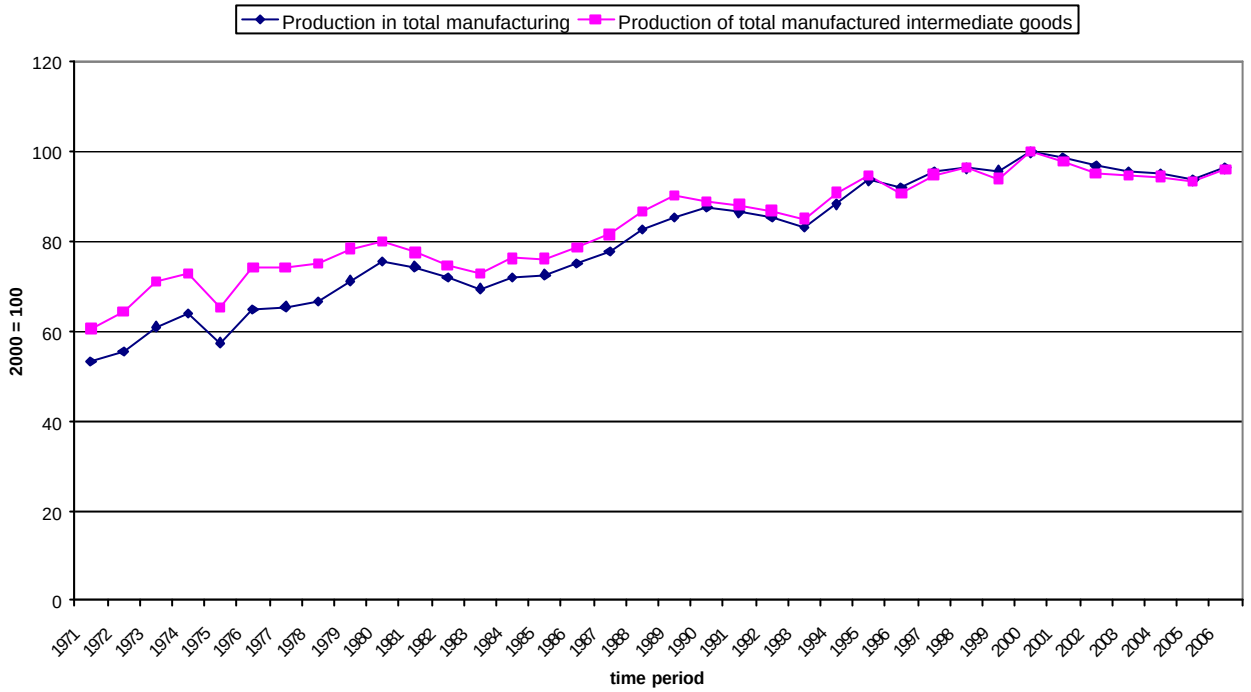
Source: EUROSTAT Database.

Graph 4. France: production of final and intermediate goods 1970-2006



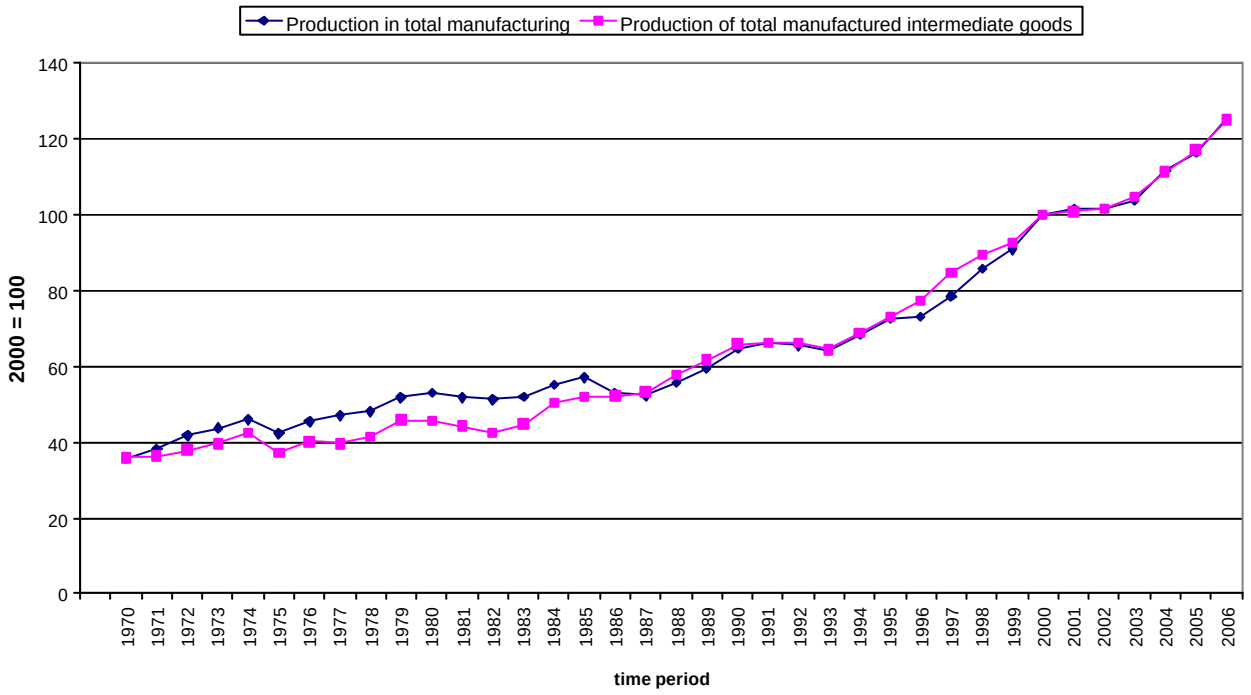
Source: EUROSTAT Database.

Graph 5. Italy: production of final and intermediate goods 1971-2006



Source: EUROSTAT Database.

Graph 6. Austria: production of final and intermediate goods 1970-2006



Source: EUROSTAT Database.

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