The globalisation of inflation: a view from the cross section

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Abstract

We examine whether a higher degree of trade integration is associated with a higher rate of price spillovers. More specifically, we examine how bilateral sector-specific trade integration affects the bilateral co-movements of sectoral prices. Our findings suggest that increasing trade integration was associated with a significant increase in the rate of price spillovers, which is consistent with the hypothesis that increasing real integration has made the inflation process a more global one. We conclude with describing our current work in this research field.

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Introduction

Measured as a percentage of world GDP, global trade in goods and services increased from 12.1% in 1960 to 27.9% in 2010. Given this substantial increase in international transactions, the average country is much more exposed and susceptible to international shocks today than it was half a century ago. This observation has led many observers to argue that the increased real integration has also caused the increased co-movement of international prices (as documented by Monacelli and Sala (2009), Ciccarelli and Mojon (2010), Surico and Mumtaz (forthcoming), and Andrade and Zachariadis (2012)), ie many observers subscribe to the view that trade globalisation has also caused a "globalisation of inflation".

Despite this argument's intuitive appeal, the economic profession is split on whether trade globalisation has indeed *caused* a more globalised inflation process. On the one hand, Borio and Filardo (2007), building on Tootell (1998) and Gamber and Hung (2001), pioneered research that documented the importance of trade integration for the spillover of inflation. The first step of their empirical strategy is to construct a "global output gap" in the baseline specification equal to the trade-weighted average of the output gap prevailing abroad. In a second step, they then document that the global output gap has gained increasing importance as a determinant of domestic inflation, a development that was mirrored by the decreasing importance of the domestic output gap.

On the other hand, Ihrig et al (2010) challenge Borio and Filardo, claiming that their results depend on the particular specification of the estimated regressions. In the alternative specifications of Ihrig et al, the global output gap does not matter significantly for domestic inflation and neither do they find any evidence that it has gained importance in recent years.

As argued by Bianchi and Civelli (2010), a major difference between the approaches of these two contrasting views concerns how inflation expectations are modelled. This argument is related to a fundamental critique of any study on how global forces affect local equilibrium inflation, with monetary policy endogenously reacting to price shocks. If, for example, a national central bank adjusts its monetary policy such that it exactly counteracts any imported inflationary pressure, the observed relation between the global measures and domestic inflation is absent even if sizeable international price spillovers exist.[2]

While we believe that sophisticated time series estimation techniques may improve upon on this endogeneity issue (see, for example, the work of Mark A Wynne in this conference volume), we also believe that a look at a dimension other than time can more directly shed light on this issue. We therefore take a closer look at the cross section, ie sectoral data.

Identifying price spillovers from sectoral data has two advantages over the study of price spillovers in the aggregate. The first concerns the endogenous response of central bank policy to inflation spillovers. In each country and at each point in time, the exposure to global shocks varies across sectors. Thus, one can identify the importance of price spillovers by examining how the relative exposure to global shocks translates into relative sectoral price developments. Because the latter comparison is relative, one can identify the coefficients of interest abstracting from the aggregate over-time variation (technically, this is done by adding time fixed effects for each country).

[2] Another contentious issue is how policy should react to imported inflation. Corsetti and Pesenti (2005) analyse optimal monetary policy among interdependent economies and find that monetary policy should react to the exchange rate. Gali and Monacelli (2008), however, find that, under the assumption that preferences are such that expenditure shares of home and foreign goods are constant and there is no intertemporal optimisation, the optimal policy regime only targets the domestic inflation rate so that the consumer price inflation rate varies with fluctuations of the terms of trade.

The second advantage of using sectoral data is that it allows us to discern the effect of real integration from other forms of integration. For example, it is true that Germany and the Netherlands are well integrated in real terms and their inflation rates also co-move closely, but much of the degree of inflation co-movement can probably be attributed to factors other than trade integration – most notably a common monetary policy. The wealth of sectoral data allows us to link real integration and price spillovers in a more causal sense as the degree of real integration varies across sectors. We can thus examine whether bilateral price spillovers play a more important role in more integrated sectors.

While the cross section thus offers a much clearer link between price spillovers, it also has an obvious limitation, namely the fact that relative price shocks by no means necessarily translate into aggregate inflation.[3]

In this note, we thus present some evidence derived from an ongoing project (see Auer and Sauré (2012)) documenting that international spillovers of producer prices can be related to trade linkages at the sectoral level: we assess the rate at which shocks to producer prices in exporter countries spill over to producer prices in importer countries. We then examine how the rate of spillover is affected by the degree of real integration.

For our estimation, we utilise the dataset compiled by Auer and Sauré (2012) that covers the following three dimensions. First, our data cover 21 OECD countries, including the major world economies.[4] Second, our data cover the years 1975 to 2010 on a monthly frequency (1998–2010 and 1996–2011 for the United States and Canada, respectively). Third, the data is disaggregated and covers 21 sectors classified by the Classification of Economic Activities in the European Community (NACE) at the two-digit level of disaggregation.

Some estimation results

According to our conjecture, the degree of bilateral import penetration should be an important determinant of the spillover rate of producer prices from exporter to importer countries. To account for this effect, we augment a standard dynamic panel regression by adding an interaction term between the change in producer price index $\Delta ppi_{j,s,t}$ and a measure of bilateral import penetration, $w_{j,i,t}$, which yields the specification

$$\Delta ppi_{i,s,t} = \alpha_{i,j,s} + \sum_{k=0}^{L} \beta_k \Delta ppi_{j,s,t-k} + \sum_{k=0}^{L} \theta_k w_{j,i,s,t-k} \Delta ppi_{j,s,t-k} + \varepsilon_{i,j,s,t} \qquad (1)$$

The variable Δppi stands for the change of the sectoral producer price index on a monthly frequency. This index is specific to the sector-country pair, indicated by the subscripts *i* for the country and *s* for the sector. Periods are indicated by *t*, the data are on a monthly frequency. The spillover rate is defined as the sum of the estimated coefficients $\beta = \sum \beta_k$. Sector-importer-exporter specific fixed effects are accounted for as well as the corresponding time trends (not reported in (1)). These latter capture, among others, trends in sector-specific

[3] Ball and Mankiw (1995) note that relative price shocks affect equilibrium inflation if they have an impact on the distribution of sectoral price changes (see also Balke and Wynne (2000)). In the presence of menu costs, the skewness of relative shocks has an effect on equilibrium inflation owing to the asymmetric price responses of firms to small and large shocks. Auer and Fischer (2010) document that, in the United States, the increase in import competition from low-wage countries has induced such a shift in the distribution of price changes.

[4] The 21 different countries are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Romania, Slovenia, Spain, Sweden, the United Kingdom and the United States.

technological change and country-pair relations. Finally, $\varepsilon_{i,j,s,t}$ is an error term that depends on importer, exporter, sector and the month.

The measure of import penetration $w_{j,i,s,t}$ is defined as the value of shipments from the exporter country *j* to the importer country *i* in sector *s* over the value of output of the importer country *i* in sector *s* plus the value of total imports by country *i* , ie

$$w_{j,i,s,t} = \frac{X_{j,i,s,t-12}}{X_{i,s,t-12} + \sum_{m \in M} X_{i,m,s,t-12}} \tag{2}$$

where $X_{i,j,s,t}$ are bilateral export volumes from *j* to *i*, $Y_{i,s,t}$ is national output of sector *s* at time *t.* To mitigate endogeneity problems in the measure of import penetration with prices, we lag the import penetration in our estimation by one year.

We run regressions of specification (1) for time-lags up to 24 months. Figure 3 plots the cumulative effect of the plain spillover rate, ie the estimated sum of the coefficients ($\sum \beta_k$) for each lag length (blue line). The spillover rate peaks around four to five months after impact at levels above but close to 25%. In the longer run, it then falls back to levels below but close to 20%.

We note that there is no clear interpretation of the main effect in (1), ie the expression $\beta = \sum \beta_k$, which is represented by the blue line in Figure 1, suffers an obvious endogeneity problem since, by construction, for each country pair *i* and *j*, a shock to *i* is treated as a dependent and as an independent observation at the same time. Thus, if a shock originates in one country, it appears in the dependent variable for part of the observations. Similarly, if shocks to global supply or to global demand hit a specific sector uniformly across all countries, the resulting common price change will induce an upward bias of the estimated coefficient β from specification (1). Overall, problems of endogeneity and omitted variables preclude a clean interpretation of the respective coefficient.

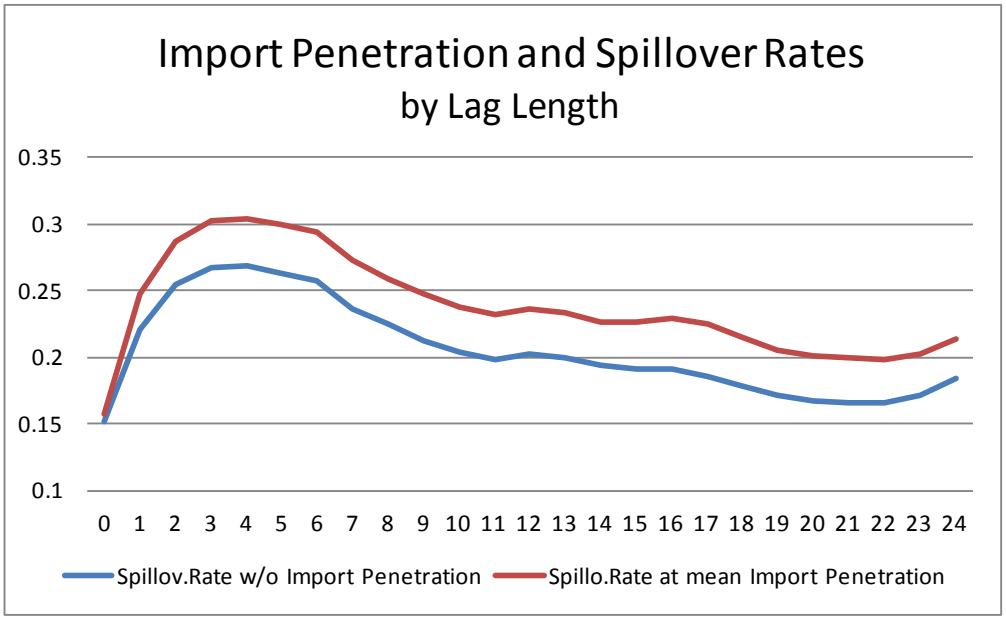
The main insight derived from these results is that price spillovers are larger in more integrated country sector pairs. To represent the average effect that comes in addition to the plains spillover effect, the red line in Figure 3 represents the spillover at the mean import penetration, defined in (2). The mean import penetration is 2.05%. Thus, the red line plots the expression $\sum(\beta_k + 0.0205 \cdot \theta_k)$ as a function of the lag-length *k*. As expected, the additional effect is positive, ie a higher import penetration results in a higher spillover rate.

A change in the producer prices in country *j* does not affect producer prices in country *i* very much if country *j* exports virtually nothing to country *i*. Instead, if country *j* is the dominant supplier for country *i*, its price changes strongly impact producer prices in country *i*.

A typical specification of (1) with 12 lags suggests that for each additional percentage point of import penetration the spillover rate increases by about 1.6 percentage points. The estimates also suggest that a very substantial increase in the average spillover rate was brought about by the increase in globalisation mentioned in the introduction that raised trade shares from 12.1% of world GDP in 1960 to 27.9% in 2010.

Figure 1

Estimated general cumulative spillover rate and spillover at mean import penetration from exporter country to importer country based on equation (1)



Conclusion

In this note, we present evidence that a higher degree of trade integration is associated with a higher rate of price spillovers. The key novelty of our analysis is its focus on sectoral prices, which allows us to quantify the importance of price spillovers even if the central bank reacts to imported inflation. We examine how bilateral sector-specific trade integration affects the bilateral co-movements of sectoral prices conditional on sector, country-pair and time characteristics. Our findings suggest that increasing trade integration has caused a significant increase in the rate of price spillovers.

In Auer and Sauré (2012), we examine whether these results also hold conditional on sector, country-pair and time characteristics. We also extend these results, decompose the precise channels by which real integrations foster the spillover of price shocks, and develop a theoretical model of the international supply chain, price complementarities (based on an extension of Auer and Schoenle (2012), and price spillovers in an integrated world to guide our analysis. Among other things, we utilise input-output tables to show the importance of the international supply chain for international price spillovers.

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