



BANK OF ENGLAND

# Speech

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## Monetary policy and open questions in international macroeconomics

Speech given by

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## Introduction

Thank you for the invitation to speak this evening. John Flemming was an extraordinary figure in academia and public policy and it is an honour to give a lecture in his memory.

There is a lot going on at the moment, in economics and in politics. But in this lecture, I would like to take a longer-term view instead of looking at the events on the foreground, dramatic and important as they are, and consider some open questions in international macroeconomics. These questions, though slow-burn and global in nature, will also have some bearing on the UK outlook and will, directly or indirectly, have implications for living standards in the United Kingdom.

I will focus on three ideas that have dominated the policy and academic debate in the years since the crisis. These are a) the role of the dollar in international trade; b) the effect of trade barriers on the economy and c) the so-called 'Doom Loop' connecting sovereign and bank risk – which has been the source of much concern in the euro area.

These topics are not entirely new ground. Indeed, John Flemming's first and final issues as editor of the *Economic Journal* both contained articles on the effect of changes in tariffs. One difference is that in those days, the tariff changes in question were reductions rather than increases.<sup>1</sup> Many of the effects of the use of the dollar as invoice currency in international trade transactions have also been discussed before in the context of local currency pricing. And John Flemming himself contributed greatly to the debate on the early successes and failures of the euro.<sup>2</sup>

Our nascent understanding of these issues has led to a number of policy proposals. Today, I want to argue that the ideas behind these proposals may only capture part of the picture. In doing so I will draw on some recent research of my own<sup>3</sup>. What links my arguments is the importance of considering general equilibrium effects. And in particular, of considering the role of monetary policy in influencing what we observe in the data. On each idea, current thinking needs to evolve before we can conclude that these issues are settled.

## Trade with dollar invoicing

Trade is currently the key topic on the international policy agenda. And for the past 50 years, exchange rates have been seen as key determinants of trade flows, at least in the short term. It is no surprise therefore that debates over trade policy often bleed into arguments over the appropriate exchange rate. But recently, the

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<sup>1</sup> Effects of the Kennedy Round Tariff Concessions on the Exports of Developing Countries by J.M. Finger (1976); and General Equilibrium Evaluations of Tariff-Cutting Proposals in the Tokyo Round and Comparisons with More Extensive Liberalisation of World Trade by Fred Brown and John Whalley (1980).

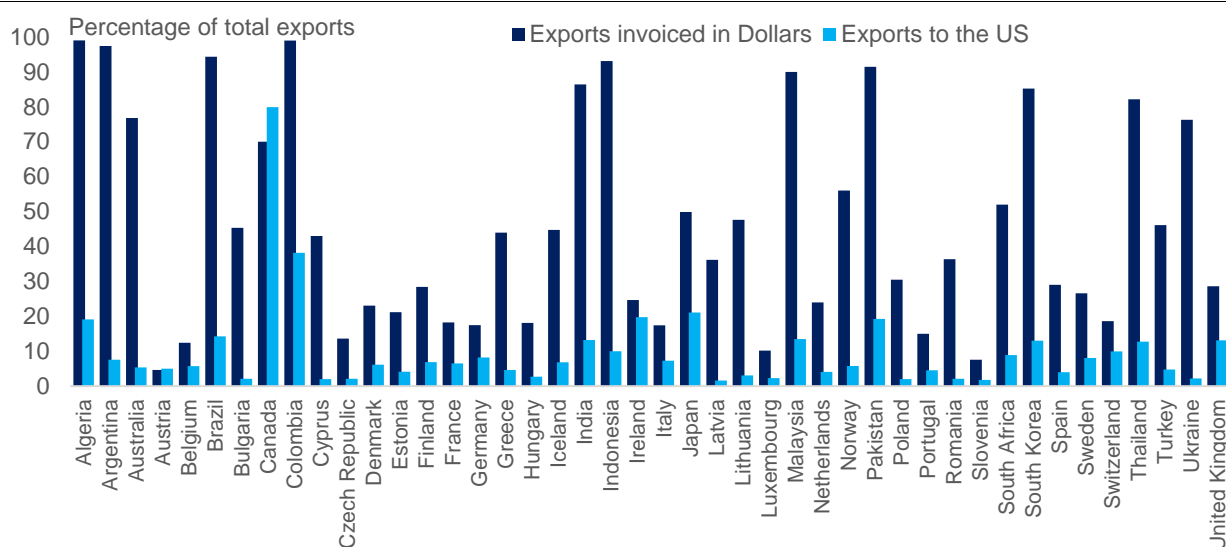
<sup>2</sup> In his role as the first chair of CESifo's European Economic Advisory Group. See Corsetti *et al* (2002).

<sup>3</sup> Ashtari Tafti and Tenreyro (forthcoming); McLeay and Tenreyro (forthcoming).

conventional view that exchange rate movements affect trade flows has been called into question by a number of academics and by policy institutions such as the IMF.<sup>4</sup>

The idea driving this change of view, is the recognition that the dollar now plays a vastly outsized role in international trade. While the US accounts for only 10% of global trade and 15% of world GDP, around *half* of global trade is invoiced in US dollars. **Figure 1** shows that in many countries the dollar is even more important, being used as the invoice currency for even larger shares of non-US exports. Others have discussed the various trends, such as the lengthening of global value chains, which have driven this feature of international trade.<sup>5</sup>

**Figure 1 – Shares of exports traded with the US and invoiced in dollars, by country**



Source: Gopinath (2016) and IMF Direction of Trade Statistics.

The suggested upshot of dollar invoicing is that exchange-rate movements have only small effects on a country's export volumes, at least in the short term.<sup>6</sup> In the standard sticky price (New Keynesian) model, it is true that this is an implication of dollar pricing. If monopolistic prices are sticky in dollars, the argument goes, a depreciation by any (non US) country does not change the export price. If the dollar prices of exported goods do not change, then there may be no incentive for foreign consumers to purchase more of them. In the jargon of the literature, there is no expenditure switching towards that country's exports.

To give a concrete example, suppose there is a fall in the value of the Chilean peso. The majority of Chilean exports are priced in dollars, so if their prices are sticky (as assumed in the model), the depreciation has no

<sup>4</sup> See IMF (2019), Carstens (2019), Gopinath *et al* (2019), Boz *et al* (2019) and Gourinchas (2019). See also the discussion of these ideas in Carney (2019).

<sup>5</sup> See Gopinath (2015), for example. IMF (2019), Gopinath *et al* (2019) and others argue that the growth of global value chains also reduces the impact of exchange-rate movements on profitability and the response of export supply, as an increasing proportion of inputs are imported, and so are also priced in dollars.

<sup>6</sup> Governor Carney's remarks at the 2019 Jackson Hole Symposium discussed some of the broader implications of this and other developments for the international monetary and financial system (Carney, 2019).

effect on the dollar price. For a country which imports Chilean products, such as Brazil, the price of these imports in Brazilian real only changes if the real-dollar exchange rate has changed. If prices are sticky, there may be little direct effect. By contrast, in the UK, around half of exports are invoiced in sterling. When the pound falls, these goods automatically become cheaper for foreign buyers. UK export demand is likely to increase on impact.

This idea has led to policy recommendations on the desirability of fully floating exchange rates. Gopinath (2017a, 2017b) argues that there are severe limitations on the ability of exchange rates to close output gaps and achieve full employment. She suggests that less flexible exchange-rate regimes, such as managed floats, may therefore be the best framework for most countries. Following on from this view, in their 2019 External Sector Report, the IMF warned that exchange-rate flexibility may need to be supported by other policies. IMF modelling even suggests that countries with a high degree of dollar pricing may require larger capital controls.<sup>7</sup>

The debate also has important implications for the UK and for monetary policy. As a highly open economy, the export response to movements in sterling is a crucial margin of adjustment to various shocks hitting the UK. And the response of net trade to the exchange rate is also a significant part of the monetary transmission mechanism. Without it the transmission mechanism would be weakened, i.e. the response of the economy to changes in interest rates would be smaller, compared to a situation where all goods were priced in sterling. The share of UK exports priced in dollars may also grow over time, given the network effects associated with invoice currency choice, as well as the likelihood that after Brexit, a higher proportion of UK trade will be with countries where dollar invoicing is more prevalent.

### **Why depreciations still benefit exporters**

I would argue that exchange-rate movements do affect exports, in a variety of ways. Dollar invoicing may affect the pricing decisions of some export goods on some occasions, but focusing too narrowly on these decisions misses several important channels. While the textbook New Keynesian model is a useful and tractable abstraction, we should be careful not to treat it too literally. As I set out in some forthcoming research, there are at least three important reasons why a depreciation will still expand exports, even if current exporters' prices are invoiced in dollars.<sup>8</sup>

First, a depreciation increases exports' profitability, as export prices increase relative to labour costs.<sup>9</sup> (Imported inputs mitigate the increase in profitability, but to the extent that labour costs adjust more slowly, profitability will rise). The increased profitability opens a number of potential entry margins at different levels,

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<sup>7</sup> Gopinath (2019). In the presence of currency mismatches on borrower balance sheets, the modelling suggests that capital controls can mitigate some costs of exchange-rate fluctuations. If, as the models assume, exchange-rates have small effects on trade volumes under dollar pricing, then any benefits of capital controls are amplified.

<sup>8</sup> McLeay and Tenreyro (forthcoming).

<sup>9</sup> See Broadbent (2017), who makes a similar set of points and also stresses the effect of the exchange rate on the profitability of tradeable goods.

many of which can take place quickly. Exports expand at the extensive margin since none of these new margins are bound by the stylised sticky-price contract signed in our models. In particular, many products and services that were not exported before are now competitive in international markets; new market destinations become profitable.<sup>10</sup> These margins can be filled by incumbent exporters, who are typically large and multi-product firms that are able to respond rapidly.<sup>11</sup> There can also be entry of new potential export firms, which now find it profitable to sell abroad either directly or indirectly, by piggy-back exporting on existing exporters and intermediaries.<sup>12</sup><sup>13</sup>

To return to my earlier example, even if exporters of a particular Chilean wine brand, for instance, were unable to change dollar prices charged in Brazil, competitor wine producers would find it profitable to enter the market and undercut the incumbent. And producers of other products that were not previously exported, may also find it profitable to export at a given dollar price, since this would translate into higher peso revenues. Anecdotally, the effects on profits and production explain why it is easy to find examples of export firms (actual or potential) welcoming currency depreciations, even when dollar export pricing is widespread.<sup>14</sup>

Second, while we have a wealth of evidence that goods are invoiced in dollars, this is not necessarily the same thing as stickiness in dollars or dollar pricing. Goods may be invoiced in dollars as this is the most convenient currency for financial transactions, but exporters may still translate into local currency terms when making pricing decisions and may still adjust their prices in the event of a depreciation. Especially for large movements in the exchange rate, exporters are more likely to change prices than assumed in the simple (Calvo) pricing framework we use in our models, which prevents some firms from changing their prices no matter how large is the shock.<sup>15</sup>

The final reason concerns many countries covered by IMF programmes: several are commodity exporters that are price takers on global markets, facing perfectly flexible prices. As a result, the arguments on stickiness and monopolistic power above do not apply; when the Chilean peso depreciates, it becomes profitable to expand copper production at the unchanged dollar price. This is especially the case as the cost of the main input, labour, tends to be sticky in domestic prices.<sup>16</sup> The constraints on exports' expansion in this case are on supply capacity, not on the demand side (as in the New Keynesian model).<sup>17</sup> I discuss these

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<sup>10</sup> These margins are important empirically. Bernard *et al* (2009) report that changes in the set of products and countries that US firms export to from accounted for an average of 31 per cent of annual changes in exports between 1993 and 2003.

<sup>11</sup> Empirically, product switching is frequent. Bernard, Redding and Schott (2011) find that one half of US manufacturing firms alter their product mix at least every five years. Bernard and Okubo (2018), using annual data, report that 20 per cent of Japanese manufacturing firms change their product mix each year.

<sup>12</sup> In the presence of sunk costs of entry, entry of new firms may be more likely for depreciations that are perceived to be more persistent.

<sup>13</sup> See Dhingra and Tenreyro (2017) for evidence of piggy-back exporting in agricultural markets.

<sup>14</sup> For example, see ["Reeling peso to boost some Argentine companies despite debt woes" \(Reuters, May 14, 2018\)](#), and conversely, ["Peso's Rise Squeezes Chile's Exports" \(Wall St Journal, Jan 28, 2004\)](#).

<sup>15</sup> This point was recently made by De Gregorio (2019). Corsetti, Crowley and Han (2018) present microeconomic evidence consistent with the idea that the invoice currency of UK exports *does* match the pricing currency, but they do not explore any potential non-linearities in the pricing decision. They also present evidence that there is often switching between invoice currencies at a relatively high frequency, which is unlikely to be consistent with sticky dollar prices.

<sup>16</sup> Even if input prices were set in dollars (if production used imported inputs, for example), the depreciation will make those dollar profits worth more in domestic currency.

<sup>17</sup> In addition, these nominal effects may boost share prices and price-to-earnings ratios, as pointed out by Forbes (2014).

mechanisms in some of my recent research, which also shows the advantages of flexible exchange rates for small commodity exporters.<sup>18</sup>

Even for goods other than commodities, demand is often highly elastic on international markets. If so, it will be highly profitable to cut prices and boost market share following a depreciation. A small cut in export prices might be enough to expand sales when the demand elasticity is high. Even if we see low exchange-rate pass-through in the data, this is exactly what we should expect with price-elastic demand and highly responsive export volumes, and not necessarily a sign that exports are unaffected by the exchange rate.

If the answer is not so clear-cut from the models, what do the data tell us?

Proponents of the idea that exchange-rates do not affect exports have presented some empirical evidence that, on the face of it, might support that view. Papers by Boz *et al* (2018) and IMF (2019) find weak correlations between movements in bilateral (non-US) exchange rates and subsequent changes in bilateral trade volumes. They report higher correlations between trade volumes and US dollar exchange rates.

But just as we know that correlation does not imply causation, nor does a lack of correlation refute a strong causal link.<sup>19</sup> The correlation instead represents the combination of any number of causal links going in both directions between exports and the exchange rate.

The key point, as previously emphasised by Broadbent (2017), is that depreciations do not come from nowhere. They are usually caused by bad news somewhere else in the economy, which would typically also be associated with a fall in exports. This negative correlation blurs any underlying positive relationship between depreciations and export volumes. A crucial example of such a mechanism, which I have discussed in other contexts before, is the response of monetary policy.<sup>20</sup>

This is illustrated in **Figure 2**, which shows a standard export demand relation, where exports increase as their price falls (the real exchange rate depreciates). All else equal, a fall in export demand would shift the curve to the left. But this would also open up a negative output gap. A monetary policymaker who cares about output volatility and the resulting fall in inflation should respond by loosening policy to stimulate the economy. One way in which looser policy boosts aggregate demand is via a depreciation in the currency. This increases the quantity of exports, shifting back to the right along the same export demand curve. But although the depreciation itself boosts exports, in equilibrium, this is masked by the initial fall in export demand. The reduced-form correlation will mix the shifts of the demand curve with the shifts along it, and the export increase will not be clearly visible in the raw data.

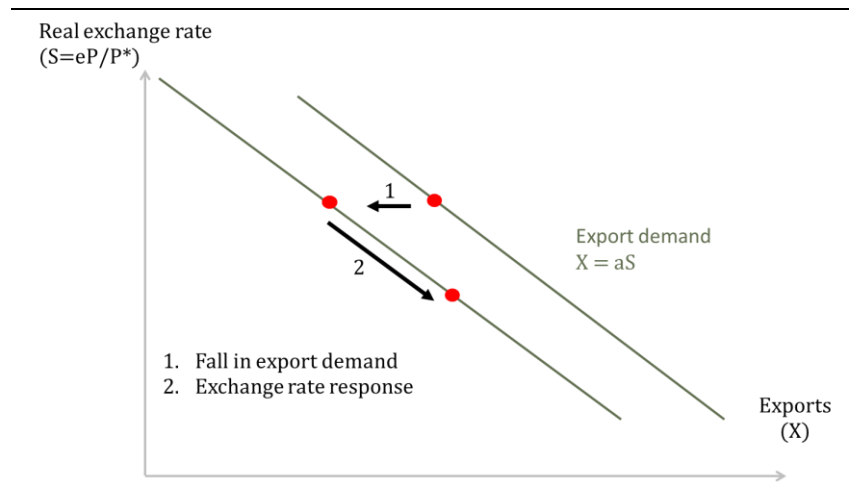
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<sup>18</sup> Dreschel, McLeay and Tenreyro (2019).

<sup>19</sup> IMF (2019) also examines the response of trade volumes to exchange rate changes instrumented using identified monetary policy shocks, which has the potential to more accurately identify the causal link.

<sup>20</sup> McLeay and Tenreyro (2019).

**Figure 2 – Illustration of export demand**



Monetary policy is one example, but there are also lots of other mechanisms which may blur the underlying relationship between the exchange rate and exports. Market expectations of future monetary policy, news about future productivity of tradeable goods relative to non-tradeable ones, or changes in relative demand, will all have impacts both on current export demand, but also on the current level of the exchange rate.

A recent example in the UK highlights these difficulties with teasing out cause and effect. During the 2007-08 financial crisis and its aftermath the pound fell by over 25%. A naïve economist would perhaps have anticipated an extremely large boost in export volumes. But the depreciation itself was partly caused by a fall in demand for key UK exports such as financial services, as well as a rapidly deteriorating aggregate demand outlook, which necessitated an aggressive monetary policy response. Looking solely at the muted response of exports following the depreciation conflates the actual response with the negative effects of the initial fall in demand for products in which the UK specialises.

To summarise, the dominance of the dollar in international trade is an important phenomenon. But unlike in some of our stylised models, I think that the exchange rate continues to have important effects on export volumes. And as a result, even in countries where dollar invoicing is widespread among exporters, I do not see a strong case for moving away from the well-established benefits of flexible exchange-rates.

### **The effect of trade barriers**

I have argued that the evidence remains consistent with the idea that exchange rate movements are a crucial determinant of changes in trade flows. Over longer horizons, trade is also determined by other factors, including comparative advantage and barriers to trade.

Perhaps even more so than exchange-rates, the role of trade policy and the impact of heightened trade tensions have been the most important policy topics in international economics over the past couple of years.

That has been primarily due to the escalating trade war between the US and China. Successive rounds of tariffs levied by the US and retaliation from China mean that bilateral tariffs between the two countries are expected to have increased by around 20 percentage points over the past two years. And there have been signs that these trade tensions may spread. Trade arrangements have also been a key issue to consider during my two years on the MPC, which have involved assessing how the UK's 2016 vote to leave the EU is likely to affect the economic outlook.

There is broad agreement among economists that trade barriers are negative for global growth. Tariffs lower the gains from trade, although there can be winners and losers. Countries subject to trade barriers are likely to see negative effects on activity – as we are starting to see in China and perhaps soon in the US. And so too will countries that make up part of their supply chain – Germany appears to have been a casualty of lower demand for Chinese exports, which has in turn reduced China's demand for capital goods imported from Germany. But there may also be benefits to some countries, due to trade diversion effects (and within some countries, there may of course be winners and losers).

As well as these level effects, trade also has important effects on the volatility of output. Higher trade barriers lower the scope for diversification of suppliers and buyers in the event of a domestic shock.<sup>21</sup> The pool of trading partners can also affect volatility. Trading with countries that are subject to large or frequent shocks can lead to higher volatility than trading with a more stable group.

Where the evidence is less clear cut, is on how large the effects of trade barriers are. On the one hand, recent macroeconomic evidence for the US economy suggests that the effects are relatively small. World Bank Chief Economist Penny Goldberg and her co-authors estimate trade elasticities using macroeconomic data and find that the 2018 tariffs would have only a very small aggregate effect on the US economy, reducing GDP by only 0.04%.<sup>22</sup> Similarly, large macroeconomic models, such as that used by the IMF, typically find small direct effects of tariffs. In part, these results are likely to reflect the standard trade theory prediction that barriers have smaller effects on large countries such as the US.

On the other hand, some evidence from microeconomic data suggest larger effects on trade and output in the US. The Goldberg study finds that imports of specific product varieties fell by nearly one-third. A study by Flaaen *et al* (2019) examines the effect of US trade barriers on a specific product: washing machines. They find that when tariff barriers were applied to individual countries, although imports were sourced from different locations, aggregate imports were little changed. When barriers were applied to all imports, washing machine production switched to the US. These findings are consistent with significant export demand responses for individual products.

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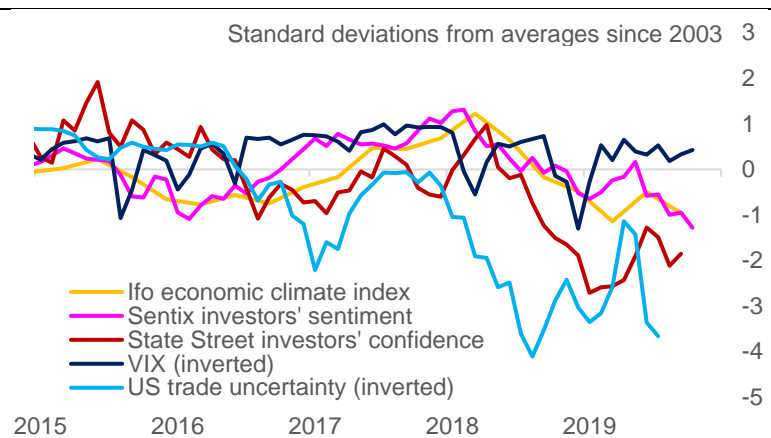
<sup>21</sup> Caselli *et al.* (2019).

<sup>22</sup> Fajgelbaum *et al* (2019).



Moreover, trade tensions have also led to large decreases in measures of confidence and higher uncertainty across the world. **Figure 3** shows that there have been sharp movements in measures of market uncertainty, policy uncertainty and business confidence since the US began implementing new tariffs on China in 2018. These increases in uncertainty and associated confidence and financial channels have likely served to amplify any direct effects on output. On the face of it, this suggests a puzzle – if the macroeconomic estimates are correct, why has uncertainty increased so much? The effect of uncertainty about small effects should be similarly small. One reason is that small aggregate effects may mask larger effects for individual firms. Uncertainty may be high even among firms who have not yet been impacted by tariffs, given the risk of further escalation.<sup>23</sup>

**Figure 3 – Measures of uncertainty and confidence**



Sources: Thomson Reuters Datastream and Baker, Bloom and Davis (2016) at [www.policyuncertainty.com](http://www.policyuncertainty.com).

Note: US trade uncertainty series is a quarterly average of monthly index.

How to reconcile the different estimates is a key question for trade policy, as well as for monetary policymakers who must react to the effects of trade barriers. If the macroeconomic effects were small, then the imposition of new trade barriers would be less costly in economic terms. For monetary policy, the direction of appropriate response is likely to depend on the balance of the effects of trade barriers on supply and demand.<sup>24</sup> But if the effects were small, so too would be the required policy response. I will argue that we can square the estimates by considering the response of other macroeconomic policies to tariffs.

### Trade barriers and macroeconomic policy

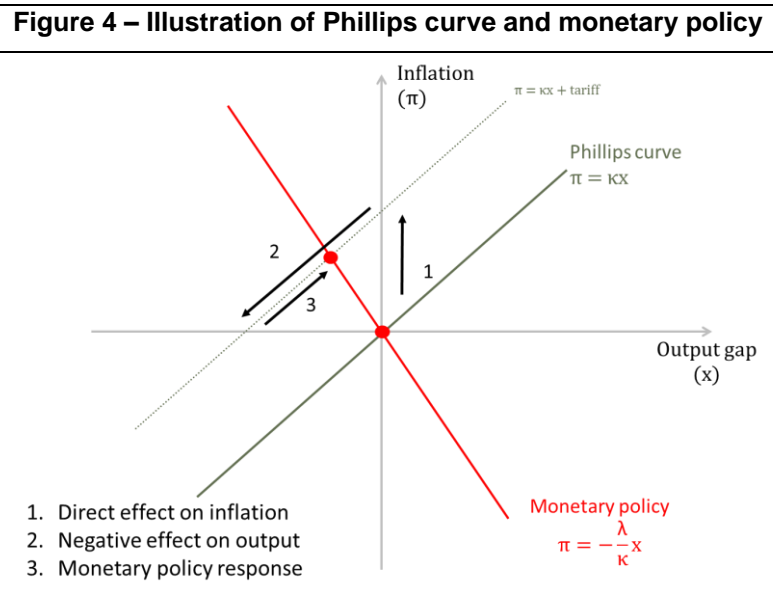
Just as with the exchange rate, I would caution against taking the simple macroeconomic estimates of the effect of trade policy at face value. These estimates and calibrations based on them are probably underestimating the effect of tariffs. The reason, again, is that the empirical estimates likely incorporate a counterbalancing policy response.

<sup>23</sup> Caldara *et al* (2019) model how uncertainty about future tariffs can reduce investment and activity.

<sup>24</sup> See Bordo and Levy (2019) for a recent discussion of the supply-side effects of tariffs.

When changes that might affect activity, such as tariff increases, are put in place, other policies are typically implemented in response to (or together with) tariff increases to mitigate the effect (e.g., fiscal stimulus, monetary policy loosening). In the extreme with a large monetary or fiscal response, the estimated trade elasticities will be very small. But these estimates confound the potentially larger negative effect of the tariff with the counterbalancing effect of policy.<sup>25</sup>

This point is pervasive across macroeconomics, and can be illustrated in a simple diagram.<sup>26</sup> **Figure 4** shows a simple model economy with a positively sloped aggregate supply relation between the output gap and inflation (also known as a structural Phillips curve). The other line gives a stylised example of how a monetary policymaker might seek to balance her mandated objective of achieving the inflation target, while avoiding undesirable volatility in output and employment. When the two goals conflict, the policymaker chooses to balance the objectives, so the line is negatively sloped.



When trade barriers, such as tariffs, are increased, two key changes occur. First, there is a direct increase of the higher tariffs on prices and inflation. This immediately shifts the Phillips curve up – in the short run, there is more inflation for a given level of output. But in a short space of time, the tariff is also likely to lead to lower production and a fall in output. It is this second effect that we would like to estimate.

However, this is only the first part of the equilibrium process. Policymakers observe (or anticipate) the fall in output and respond with more stimulus. In this example, that comes from looser monetary policy, but looser fiscal policy would have a similar effect. This shifts the economy back along the Phillips curve. The fall in output we actually observe is due to the policymaker’s choice to lean against inflation, rather than the direct

<sup>25</sup> Reversals in trade policy may also mitigate the response of exports to tariffs in the data, since firms are less likely to respond less to tariffs that they perceive to be temporary, especially when there is the threat of foreign retaliation. See for example, Ruhl (2008) and Erceg, Prestipino and Raffo (2018).

<sup>26</sup> As in McLeay and Tenreiro (2019), taken from Seneca (2018). See Kareken and Miller (1976) for an earlier version of a similar graphical exposition.

effects of the tariff. At the extreme, a monetary policymaker could opt to ignore the impact of tariffs on inflation, if she thought they might be very short-lived. If so, we may not see any effect on output in the data at all.<sup>27</sup>

In the example in **Figure 4**, the policymaker opts to partially offset the effect of the tariffs on output, so macroeconomic estimates of the effect may be too small. In practice, the policy response will depend on how much the tariffs affect demand relative to supply. If they have large effects on aggregate supply, then monetary policy will be more limited in its ability to offset them, and empirical estimates may be less biased.

In the case of our microeconomic example of washing machines: there is no response of macroeconomic policy (on their own, washing machines do not often play a major role in MPC deliberations!) We can therefore identify the effect at the microeconomic level. When there are broader tariff increases that affect the aggregate economy, there is naturally a stronger offsetting response of macroeconomic policy.

This also helps rationalise increases in measures of uncertainty. If the aggregate effect of tariffs was negligible and direct effects were limited to a small subset of producers, the effect on aggregate uncertainty should be small. But if the gross effects are larger and it is not clear that policy can continue to neutralise them indefinitely, uncertainty effects can be material. This is even more likely if there is a possibility of further trade-war escalation, which could create further uncertainty over whether policies could offset their effect.

Given the identification difficulties, I am inclined to place more weight on the microeconomic estimates of the direct effects of trade barriers on the economy.<sup>28</sup> Even for large economies such as the US, these are likely to be damaging to growth. If the initial effects are amplified by falls in confidence and higher uncertainty, the overall slowdown may be larger still. These consequences will be even more material for smaller economies.

### **The ‘doom loop’: the bank-sovereign nexus**

Trading relationships have been the major source of uncertainty during my time on the MPC. But for much of the past decade, spillovers from financial sector risks were the preeminent international issue facing governments and monetary policymakers. The 2011-12 European debt crisis, which was the source of large spillovers to the UK banking system, was amplified by linkages between euro-area banks and their governments. During my tenure on the MPC, worries about a similar developments taking root in Italy have been an ongoing concern.

The idea is that there are negative two-way spillovers between government and bank balance sheets, which combine to create a damaging feedback loop for the real economy. During the euro area crisis, there were

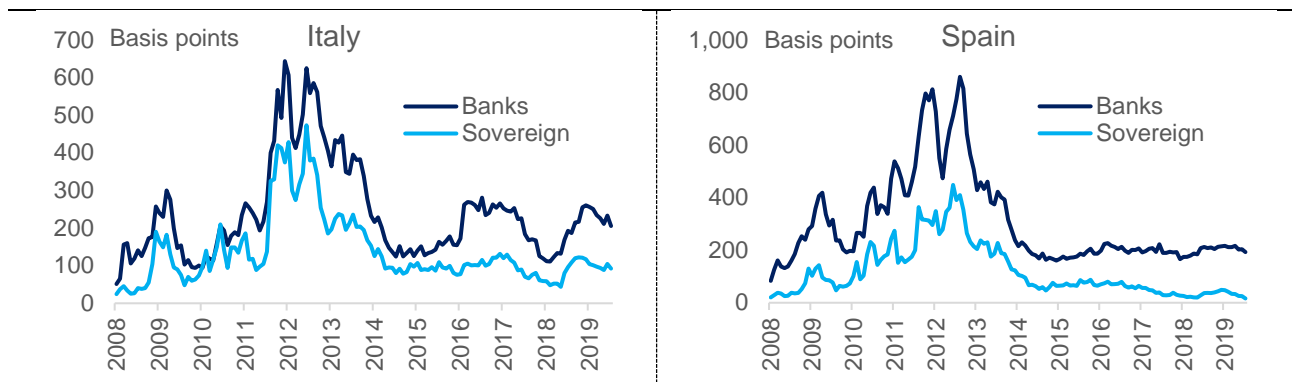
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<sup>27</sup> In practice, lags in the transmission mechanism and uncertainty over the effect of any tariffs would mean that policy is unlikely to be able to perfectly offset effects of tariffs on demand. If there are effects on supply, monetary policy will not be able to offset them without generating more inflation.

<sup>28</sup> It is also possible that some microeconomic estimates suffer from a different type of endogeneity bias, if successful lobbying for tariffs depends on opportunities and returns within a sector.

sharp correlated rises in measures of riskiness of euro area banks and their respective governments. **Figure 5** shows the correlated rises in credit default swap (CDS) premia, a market proxy for default risk on banks and on governments at the height of the crisis, and more recently in Italy. Many economists linked this observation to the presence of large quantities of their own government's sovereign debt on the balance sheets of euro area banks. This created the sovereign-bank nexus, or so-called 'doom loop'.<sup>29</sup>

**Figure 5 – Bank and sovereign CDS premia**



Source: Thomson Reuters Datastream.

The proposed mechanism arises following a negative reassessment of either bank or government finances. For example, if domestic banks make large losses on their outstanding loans, as occurred in Spain and elsewhere following the crisis. Or if investors reassess governments' ability to repay their existing debt, as happened in Greece. As the perceived risk of a government default increases, the price of outstanding government bonds falls.

The doom loop posits that if government bonds make up a sizeable proportion of domestic bank assets, then a fall in their price will reduce banks' net worth and their ability to lend to the real economy. The resulting credit crunch will lead to slower growth and lower tax receipts, further worsening the government's fiscal balance. This causes another decline in bond prices, creating a negative feedback loop. Slower growth and higher unemployment also leads to write-downs on bank credit, further impairing bank balance sheets. If the banks are bailed out, the fiscal situation is likely to deteriorate again. In all, the doom loop suggests that banks holding their own government's bonds can turn the initial negative shock into a catastrophic downturn.

Proposed policy solutions focus on ensuring that government bond holdings do not become concentrated in a given country's domestic banking system. For the euro area, these have included suggestions ranging from: full banking union with deposit insurance to achieve risk-sharing between banks; increasing capital risk weights on domestic sovereign debt to incentivise banks to diversify their holdings; or introducing a diversified safe asset that banks could hold without large exposures to any one sovereign, including their own. These suggestions aim to break the vicious circle by preventing government default probabilities from influencing bank lending decisions.

<sup>29</sup> Acharya, Drechsler and Schnabl (2014), Brunnermeier *et al* (2016), Farhi and Tirole (2018).

## Strategic sovereign default

The doom loop was no doubt important during the euro area crisis, but bank lending decisions are only one part of the story. In the extreme, the doom loop logic suggests governments who borrow from their own banking sector may be forced into default after a bad shock. But in many cases, governments also face *strategic* choices over if and how to default, which can be influenced by who will bear the cost. Abstracting from these incentives risks missing a key benefit of banks holding their own sovereign's debt.

Completely diversifying banks' holdings of government assets across countries risks a *strategic default loop*. When a large share of sovereign debt is held by domestic banks, it increases the government's incentive to repay.<sup>30</sup> If a fall in sovereign bond prices were to reduce banks' net worth, then a strategic decision to default outright would be far worse. And it would lead to the same negative consequences for bank lending to the real economy and to economic growth. As a result, governments have strong incentives to avoid default if they can.

In contrast, if government debt is completely diversified to foreign bondholders, then the immediate pain from a default may be low. This type of strategic default has more often been discussed with reference to emerging markets, where government borrowing from international creditors is common.<sup>31</sup> As the cost of default decreases and the probability of default increases, the price of government bonds fall, feeding into a similar feedback loop that precipitates a default.

These incentives suggest risks associated with policy solutions that involve banks holding *too diversified* a portfolio of government debt. Doing so may lead to a damaging strategic default loop. But given the doom loop can arise following a negative shock when banks hold *too concentrated* a portfolio, it may be socially optimal for banks to hold some intermediate share of their own government's debt.<sup>32</sup> I explore these conditions in detail in forthcoming research.<sup>33</sup>

As with the previous discussions, thinking about the full set of decisions and how they interact in equilibrium can affect the recommended policy solution. Monetary policy can also affect the conditions determining the optimal share of domestic government debt, since it can affect the severity of the doom loop channel. The euro area crisis was brought under control by the monetary policy actions taken by the ECB. If we were confident that the costs of such episodes could be mitigated by monetary policy or other central bank actions, then this would suggest placing more weight on avoiding incentives for strategic sovereign default.

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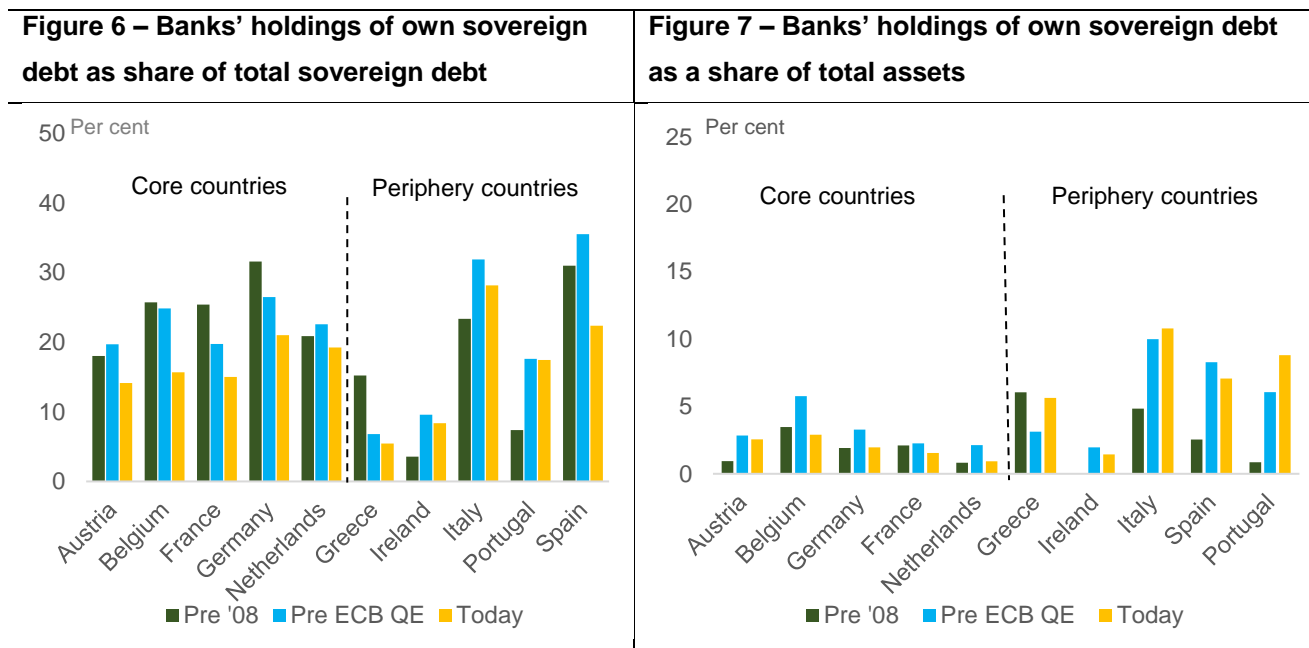
<sup>30</sup> Ongena, Popov and van Horen (2019) provide evidence that banks increase holdings of their own government's debt in stressed times due to moral suasion. They suggest this may be partly due to political pressure, but that the incentives are likely increased by the knowledge of the feedback loop negatively impacting banks if government debt auctions are undersubscribed.

<sup>31</sup> For example, Aguiar and Gopinath (2006) and Arellano (2008).

<sup>32</sup> An alternative intermediate solution would be for government debt to be held domestically, but by the non-bank private sector. This would mean that the cost of default would be borne by the domestic economy, but negative shocks would not be amplified via credit supply or bank bailouts as in the doom loop. Without the amplification via the banking sector, the cost of default would probably be lower, however, so this solution may still reduce the incentives to repay.

<sup>33</sup> Ashtari Tafti and Tenreiro (forthcoming).

Contagion may also negate some of the benefits of diversifying government bond holdings. If banks in country A hold sovereign debt issued by country B rather than their own government's, but increases in sovereign credit risk in country A also transmit via contagion to country B, then the doom loop may still operate as before.<sup>34</sup> Given these different possibilities, looking at the empirical evidence is one way to discern their relative importance.



Source: Arslanalp and Tsuda (2012) and ECB.

Notes: Pre '08 is Q4 2007; Pre ECB QE is Q4 2013. Today refers to latest datapoint available.

While the doom loop idea initially arose from an empirical observation, my interpretation is that the evidence is rather mixed. **Figure 6** shows banks' holdings of own sovereign as a percentage of total debt. As the figure illustrates, the largest pre-crisis exposure was in Germany, rather than in 'periphery' countries, where the loop was believed to be important. Even measured as a proportion of total bank assets, periphery banks' holdings were small in absolute terms before the crisis (**Figure 7**). On the amplification mechanism itself, simple regressions suggest that a one percentage point increase in a euro area periphery country's sovereign CDS premia are associated with a one percentage point increase in that country's banks' CDS premia. But the exact same relationship holds for 'core' countries. This evidence is suggestive of a larger initial shock in periphery countries than in core countries, rather than a stronger doom loop channel coming from either a stronger propagation mechanism or higher initial exposure.

While the doom loop is a plausible theoretical mechanism, this indicative evidence suggests that we need to go further to show its empirical relevance. And since the theory is not conclusive that the costs of high levels

<sup>34</sup> Popov and van Horen (2015) provide empirical evidence of a causal link between increases in sovereign risk and a fall in credit supply by banks (in other euro area countries) holding large quantities of those sovereigns' debt.

of domestic government debt holdings outweigh the benefits, more quantitative work on this issue would help quantify the relative importance of each channel and guide policy recommendations.

## **Conclusion**

I have discussed three ideas in international macroeconomics. What links them, as well as being key topics on the international policy agenda today, is that they all highlight the need for general equilibrium thinking, as well as paying close attention to gathering high-quality empirical evidence to inform the policy debate.

I promised "open" questions in the title. And I leave you with three wide open ones. I do not think these are settled issues in the literature, and hence the policy implications drawn so far are too premature.

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