

SHOULD THE BREXIT STERLING DEPRECIATION HAVE BOOSTED EXPORTS?
HOW EXCHANGE RATES AFFECT TRADE AND PRICES

UKTPO BRIEFING PAPER 44 – JULY 2020

APPENDIX

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What should we expect from a depreciation? A little bit of theory

The response of trade and trade prices to exchange rate changes is quite complicated. We sketch here a couple of diagrams that help us to think about the sort of factors that might determine the responses. Ayele and Winters (2020) offers a more technical exposition, but it is still only partial. One consequence of the theoretical complication is that it makes clear that there are no general answers and that to understand the way things work we will have to turn to empirical analysis – some of which we will describe in the main briefing paper.

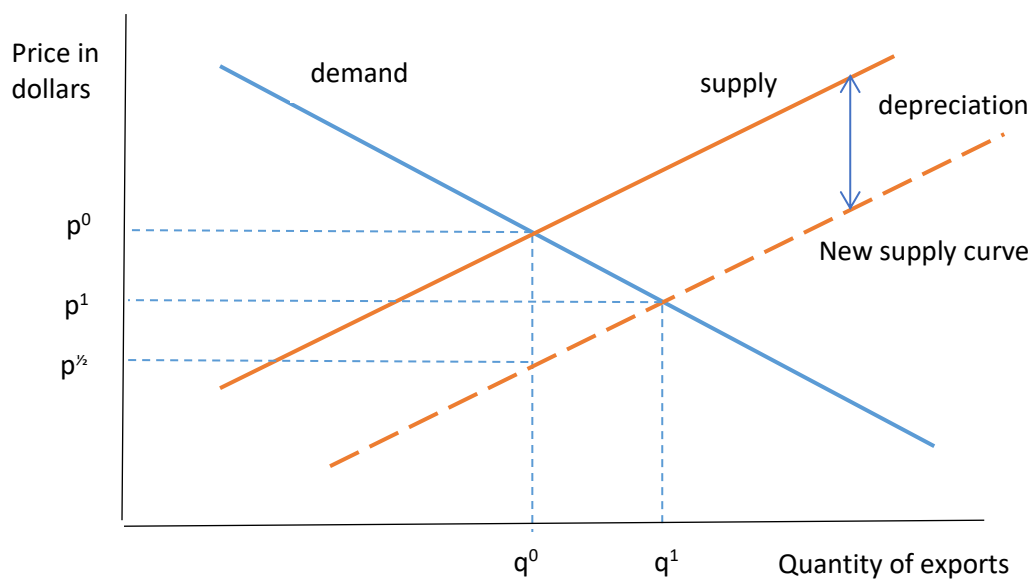
Let's start with UK exports and consider sales of one product in one market. Figure A.1 summarises the situation in a standard supply and demand diagram. It plots the quantity bought (sold) on the horizontal axis against the price charged in the demanders' market (in its currency, here denoted as dollars, but only as a convenience). If nothing else changes, the higher the price, the lower is demand and the higher is supply. These relationships are shown by the demand curve (the solid line in blue) and the supply curve (solid in red). A market is in equilibrium when supply and demand are equal and so this market settles at price p^0 and quantity, q^0 .

Without going into all the details, the demand curve is the total quantity demanded by all purchasers in the destination country at the given price (holding income and all other prices constant), whether it be for consumption or use in producing local goods or services. The supply curve is the total amount the UK industry (or firm if we want to work at firm level) is willing to supply at any price, given its costs and technology. It roughly comprises the actual cost of production plus a mark-up, either or both of which may be variable.

Now let the pound sterling depreciate so that more pounds are necessary to buy a dollar, or equally, a pound is worth fewer dollars. In the very first instance, suppose our exporters cannot change their published prices. If these were denominated in sterling, the dollar price would fall by the full amount of the depreciation – call this price $p^{\frac{1}{2}}$ to denote a sort of half-way house. If the exporter invoices in dollars, on the other hand, there will be no immediate effect and price will remain at p^0 .

Now consider a slightly longer run during which firms can change their prices. If the UK exporter's costs and mark-up do not change in sterling terms, the new supply curve in dollar terms falls by the extent of the depreciation to the broken line in figure A.1, and the new equilibrium is given by price p^1 and quantity, q^1 . Price has fallen, but by less than the depreciation. We will refer to the price fall expressed as a proportion of the depreciation as the rate of 'pass-through' – the extent to which the depreciation is passed through to (foreign currency) export prices. Corresponding to the pass-through we can also gauge the increase in quantity sold.

Figure A.1: The market for a UK export



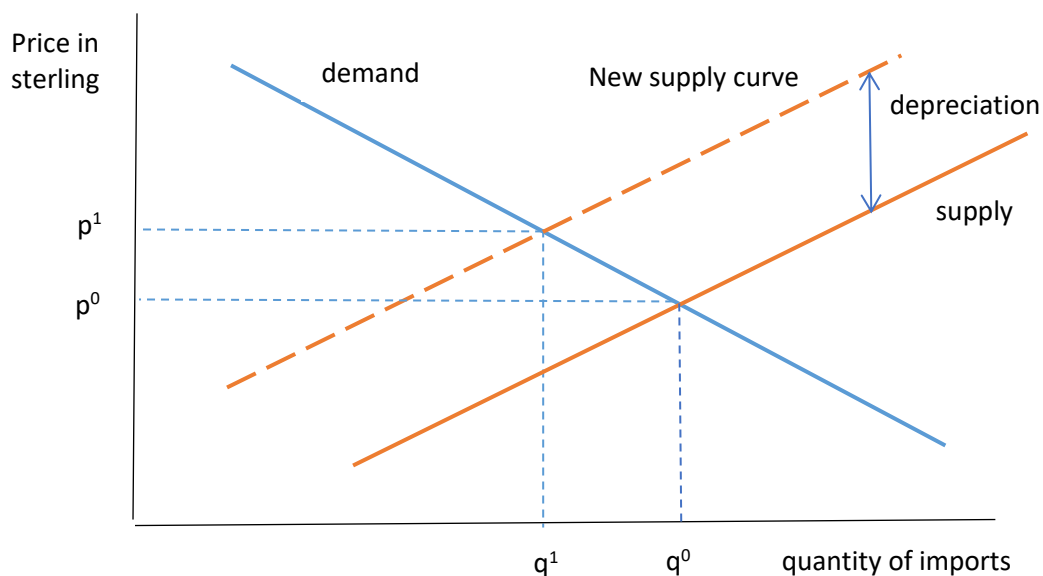
What determines the pass-through? First, the sensitivity of demand to price changes (the price elasticity of demand, in economists' terms): if demand were highly sensitive to price, i.e. the demand curve were virtually horizontal, pass-through would be very small and the change in quantity large. That is, the price is essentially determined in the foreign country and UK supply has basically no effect on it. Conversely, if demand were very inelastic (the curve were nearly vertical), pass-through would be large and quantity-change small. The elasticity of demand for UK exports depends on many things, but prominent among them is the extent to which UK goods and services are good substitutes for other suppliers'.

Second, the supply curve also matters. For example, if it were nearly horizontal – a high elasticity of supply – pass-through would also be very high and the quantity change just determined by the slope of the demand curve. If supply were very inelastic (nearly vertical) pass-through would be very low and so would be the quantity change.

Hidden away inside the diagram is a third determinant. We have drawn the supply curve as falling by the extent of the depreciation. But in fact, it may fall by less than that because a depreciation of the pound sterling might increase the firm or sector's costs in sterling terms. The sterling price of imports might rise (see below) and this could raise the price of inputs ; it could also increase the cost of living and so drive wages up. In both cases the cost of the good in sterling terms would rise, thus partly off-setting the effect of the depreciation on the dollar-price. It is also possible that, because the depreciation gives them a competitive advantage in the foreign market, UK sellers choose to take some of that as an increase in their mark-up, again preventing the supply curve in terms of dollar prices from falling by the full extent of the depreciation.

We can conduct a similar analysis for an import into the British market – again a single product from a single foreign supplier, for now. Now we measure prices in sterling terms and note that a UK depreciation means that a good with a given price in dollar terms now costs more in sterling terms – more pounds are required to buy each dollar. Figure 3 captures the situation.

Figure A.2 The market for a UK import



As before, the original equilibrium is given by price p^0 and quantity, q^0 and the new one by p^1 and q^1 , and pass-through - this time of the depreciation into the UK sterling price of imports, - by the ratio of the change in price to the extent of the depreciation. Pass-through depends on the slope of the demand curve (the elasticity of demand) - the steeper it is, the greater the pass-through. If the demand curve is nearly horizontal - domestic supplies are fierce competitors with the imports - pass-through is small.

Second, similarly to above, if the supply curve is highly elastic (is nearly horizontal), pass-through is nearly complete and quantity changes according to the demand curve. This is likely to be the case if the UK is a minor market for foreign suppliers, who can sell their wares elsewhere in the world without suffering a decline in price. (Although the figure shows the sterling price rising, the dollar price either stays unchanged or, if pass-through is incomplete, falls as suppliers absorb some of the burden of the depreciation.)

A third consideration is second round effects. Unlike in figure A.1, the supply curve, which relates the quantities supplied to prices in dollar terms is unlikely to be disturbed by a UK depreciation because the UK is too small to have much effect on costs in foreign economies. However, the demand curve - which reflects UK market conditions - is likely to be affected. There are two potentially off-setting forces: one occurs because depreciation increases prices in the UK and thus lowers real income; this implies that at any given (sterling) price consumers demand a bit less of the good. The second force, however, is that the increased cost of inputs into UK varieties of this good raises their prices, making the foreign variety relatively more attractive. The former is likely to be the dominant effect, so the demand curve will shift a little to the left, which would reduce pass-through.

Figure A.2 is useful to make one additional point. Everything so far has been about a sterling depreciation - more pounds being necessary to purchase a dollar - and, indeed, a unit of any other foreign currency. Now suppose that the supplier of the good is, say, Sweden, so that prices in Kroner determine supplier behaviour, and suppose that the Kroner **appreciates**. The net effect is still that more pounds are required to purchase a Kroner, so for the market for Swedish exports to the UK, Figure A.2 still applies. However, there is one crucial difference: only the price of the Swedish variety

is affected, the prices of imports of all other varieties of this good being unchanged. If different sources of imports are close substitutes for each other, the UK demand curve for the Swedish variety will be nearly horizontal – a small change in price will have large consequences for Swedish sales. As above, a virtually horizontal demand curve implies virtually no change in the Swedish price, so virtually none of the Swedish appreciation is passed through into the price charged for imports in the UK (Swedish exports).

This example shows that pass-through to UK import prices is likely to be quite different according to whether a given change in the Kroner-sterling bilateral exchange rate occurs because sterling depreciates or the Kroner appreciates relative to world currencies in general. Unfortunately, this is not a distinction that the literature usually draws.

Economic theory brings us one last gift: it is a truism that the difference between total imports and total exports is the difference between national expenditure and national output.¹ Thus, if, as we suggest above, exports should rise and imports fall, a depreciation must increase output or reduce expenditure. One implication is that it is easier for a depreciation to increase exports if there is spare capacity in the economy – something that is generally believed to have been lacking in 2016.²

¹ Expenditure is either on foreign goods and services (imports) or on sales in the UK by domestic firms. Output either goes to exports or to sales in the UK. Hence remove domestic sales from expenditure and output and you are left with imports and exports respectively.

² This macroeconomic constraint operates only on totals and has nothing to say about how it affects individual products and markets, which is the level at which pass-through operates. Quite how it is manifest at the lower level will vary according to circumstances, but some of it is likely to show up in aggregate prices and demand.

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