Trump’s tariffs

The events of early April 2025
as seen from a systems perspective

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This document examines the events that took place around the world after 2 April 2025, when US President Donald Trump announced that the US would impose tariffs on (almost) all imported manufactured goods.

His intent was primarily to erase trade imbalances and to encourage manufacturing in the US rather than elsewhere.

The immediate effects, however, were very different: in particular, stock markets around the world suffered large losses, the bond markets experienced high sales of US securities, US interest rates rose, and the value of the US $, as expressed in terms of many other currencies, plummeted. Furthermore, several countries – most notably China – imposed their own higher tariffs in tit-for-tat reprisals.

Over the next several days, some of the US tariffs were softened, and the stock and bond markets recovered somewhat. But, at the time of writing this document – 15 April – there continues to be much uncertainty.

From President Trump's point-of-view, all these reactions were "unintended consequences".

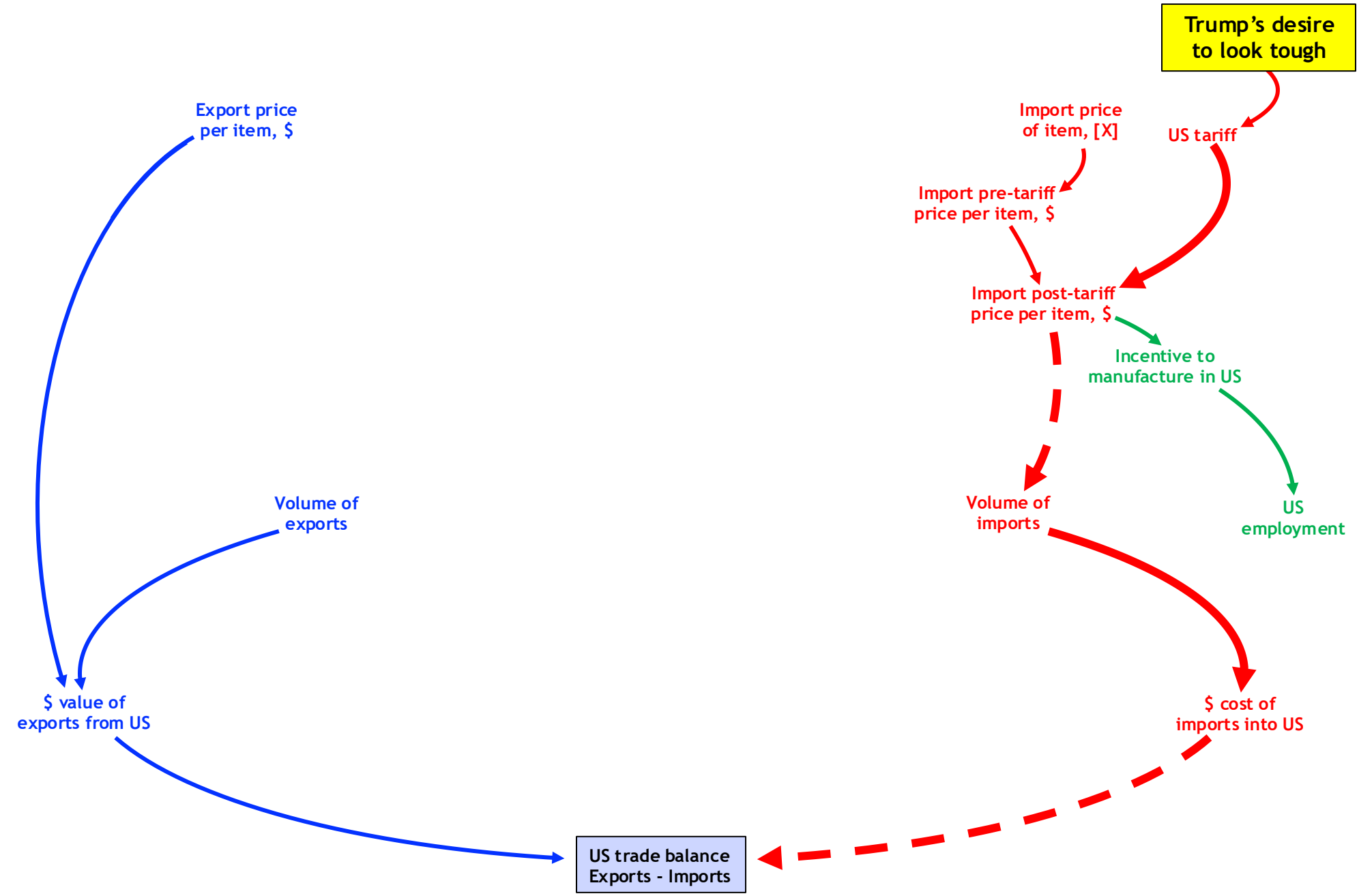
Were they?

Or is this a critically important example of the failure of a policy maker to use systems thinking*?

This document presents the author's analysis…

*If systems thinking is unfamiliar, please see pages 13 to 16.

What Donald Trump wanted



[X] is a generalised currency

For narrative, see page 3

Narrative to page 2

In so far as it is possible to understand what might be in Donald Trump's mind, here is my attempt to represent his views on international trade tariffs…

Over any time period, the *US trade balance is the difference between the value of exports and the cost of imports*. If the *value of exports* is greater than the *cost of imports*, the *trade balance* is positive; if less, negative.

Donald Trump doesn't like negative *trade balances* - he wants to eliminate them, as would, in principle, happen if the *volume of imported manufactured goods* could be reduced.

So, to make this happen, Trump's solution was to make the purchase of *imported goods* less attractive as a result of a higher *price* as caused by the imposition of a *tariff*.

The higher the *tariff*, the higher the *post-tariff price of each item* - as shown by the solid arrow connecting those two labels in the diagram, which indicates that if the *tariff* Increases, so does the *post-tariff price*, in that these two variables are 'moving in the same direction'.

As a consequence of the *post-tariff price* increase, the *volume of imports* decreases, as represented by the dashed line, which is used for variables that 'move in opposite directions' (the *post-tariff price* goes up, but the *volume of imports* goes down).

A reduction in the *volume of imports* causes a reduction in the *cost of those imports*, and since these two variables are 'moving in the same direction', the arrow is solid. For the same *value of exports*, a decrease in the *cost of imports* results in an increase in the *US balance of payments* (hence the dashed arrow).

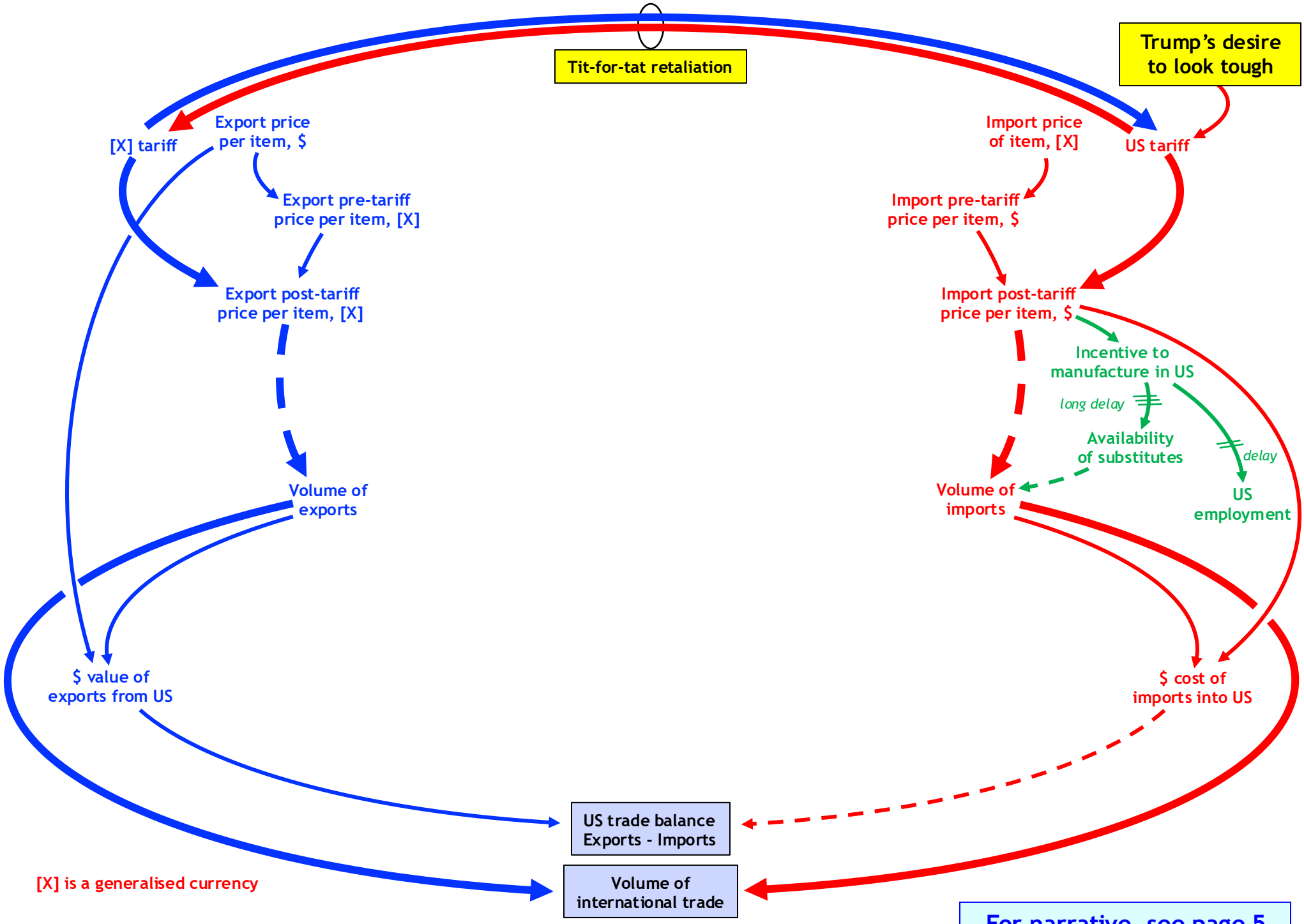
The overall result of an increase in *tariffs* is therefore to make the *US balance of payments* more favourable, which is exactly what Donald Trump wanted to achieve.

At the same time, higher *import prices* stimulate *manufacture in the US*, so providing more *employment*.

That all seems very straight-forward.

But the reality is that much more is happening…

Tit-for-tat retaliation destroys international trade



For narrative, see page 5

Narrative to page 4

One consequence of the imposition by the *US of a tariff* on goods manufactured in *country [X]*, so reducing *imports into the US from [X]*, is the possibility that *country [X]* might retaliate by imposing *their own tariff on goods they import from the US*.

As the causal loop diagram on page 4 shows, this can lead to a highly damaging lose-lose trade war.

An increase in the *US tariff* drives the *post-tariff price of imports* up.

If there are *substitutes*, or if the consumer can do without, the *volume of imports* will go down. And even if *substitutes* were originally more expensive than the *import*, if the *tariff* gets progressively higher, the *post-tariff import price* will reach a level at which the *demand for the imported product* peters out.

Furthermore, if *substitutes* are not readily available, it can take a long time to build and commission the industrial plant needed to make them. And in the meantime, if the *imported items* are necessary, US consumers are obliged to buy them, even at a higher *post-tariff price*.

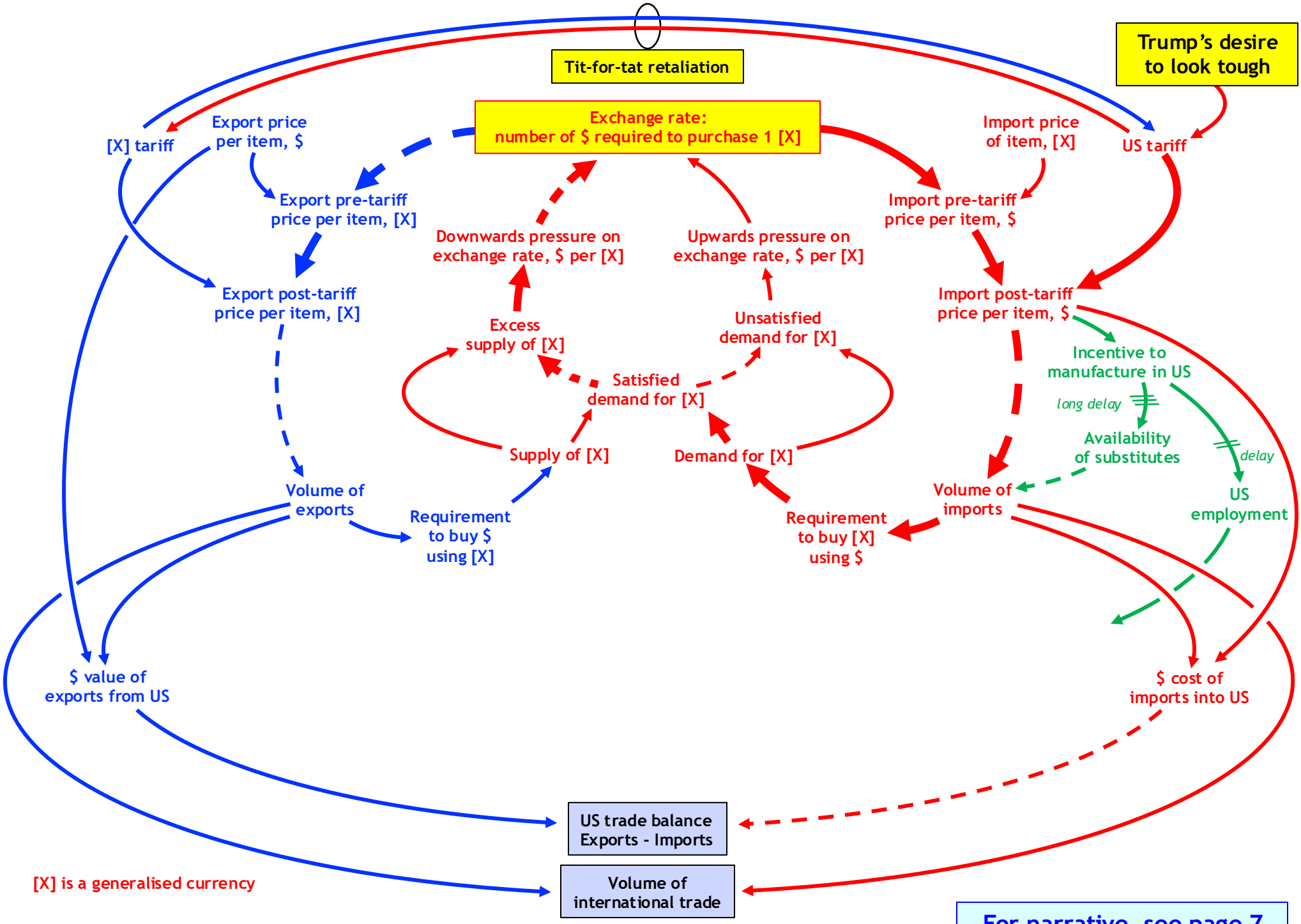
If, in response to a *US tariff*, *[X]* increases *their tariff* too, the *post-tariff price of US exports* will increase, driving the *volume of US exports* down.

If both the *US* and *[X]* increase their *tariffs* in response to one another, this fuels a reinforcing loop of ever-increasing *tariffs*, causing ever-decreasing *import volumes* and *export volumes*.

The total *volume of international trade* - this being the sum of *import volumes* and *export volumes* - therefore progressively diminishes, ultimately, in principle, to zero.

Everybody loses.

Imports become cheaper, exports dearer



For narrative, see page 7

Narrative to page 6

An increase in the *US tariff* drives the *post-tariff price of imports* up.

Unless the *imported item* is absolutely indispensable, and must be purchased in the same quantities, no matter however high the *post-tariff import price* might be, then the *volume of imports* will go down.

As progressively fewer *goods are imported*, the volume of payments in the exporter's *currency [X]* falls, and so the *requirement to buy [X] in exchange for $* also falls.

This in turn causes a fall in the *demand for [X], in exchange for $*, in the international currency markets, and if the magnitude of this fall is sufficiently large, any residual *demand for [X]* is readily satisfied, resulting in an *excess supply of [X]* - meaning that more *[X]* is generally available than is currently required.

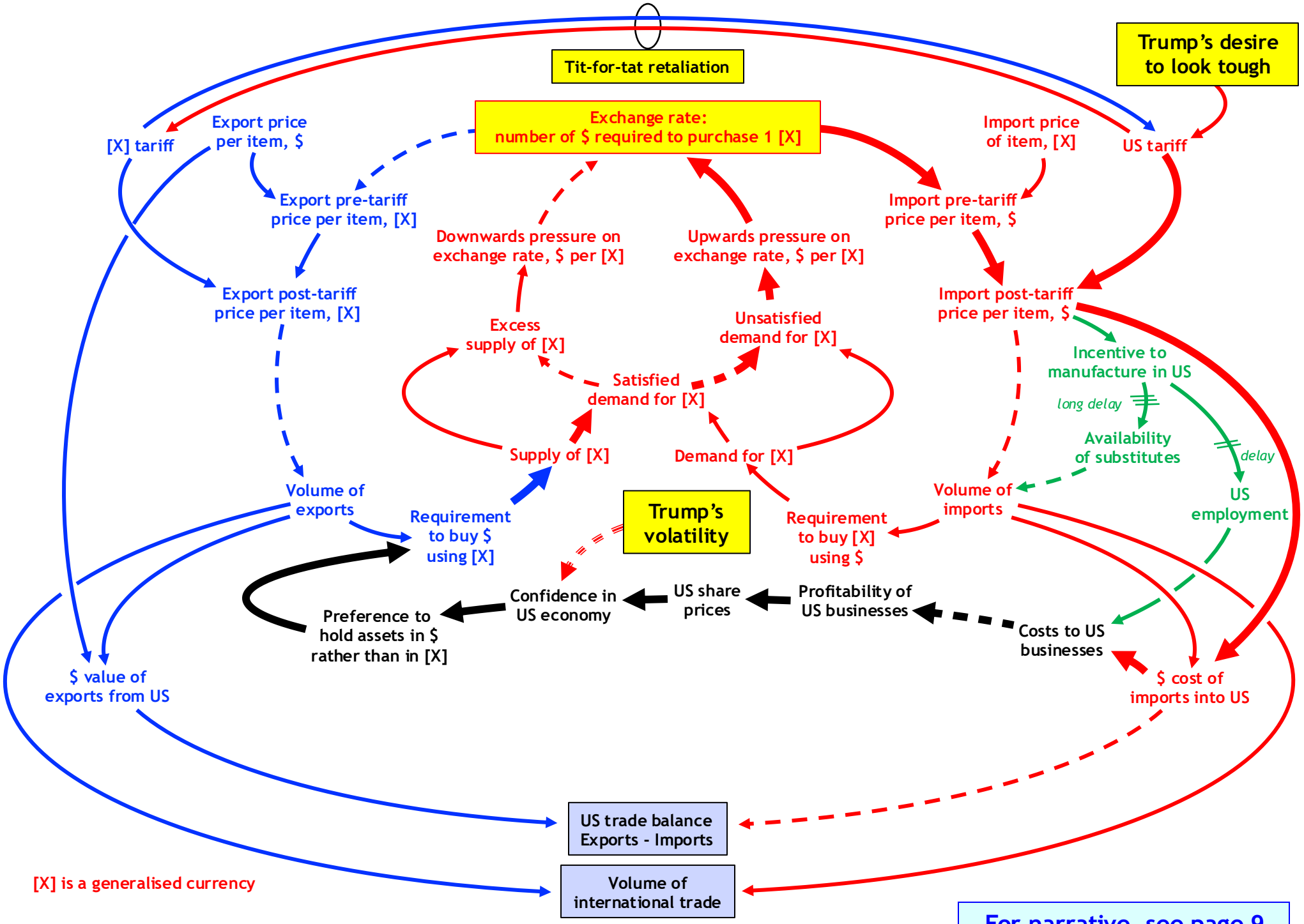
As a result, there is *downwards pressure on the $/[X] exchange rate*, in that holders of *[X]* will be more willing to accept a smaller number of *$* for each *[X]*.

To make that real... suppose that, last week, the *exchange rate* was such that *1[X]* could be purchased for *$0.5* (or, the other way about, *$1 buys 2[X]*). As a result of the *downwards pressure*, holders of *[X]* become willing to accept fewer *$* for *1[X]* - say, *$0.2 per [X]*. The *$/[X] exchange rate* has therefore fallen from *$0.5 per [X]* to *$0.2 per [X]* . Fewer *$* are now needed to buy *1[X]*, implying that the action of the *US tariff* is to strengthen the *$* as compared to the *[X]*.

One consequence of this strengthening of the *$* is that the cost in the US of a *pre-tariff imported good priced at 100 [X]* has fallen from *$50* to *$20*. This cheapening in the *price of imports* serves, at least partially, to offset the impact of the *US tariff* - as verified by the balancing loop.

At the same time, however, the cost of a US manufactured good, imported into [X], has risen. For example, at the original *exchange rate* of *1[X] = $0.5*, an item with a *pre-tariff export price* of $7 costs 14 [X]; when the *exchange rate* has fallen to *1[X] = $0.2*, the item originally priced at $7 now costs 35 [X].

Exchange rates can weaken too…



For narrative, see page 9

Narrative to page 8

The effect of the *US tariff* in strengthening the *$* with respect to the *[X]*, as discussed on the two previous pages, is attributable to the overall reduction in the *volume of imports, originally priced in [X]*. This effect, however, requires a substantial jolt to the international currency markets, and may take some time to become apparent - especially if consumers continue to buy the *imported goods*, even at higher *prices*.

There is, however, another effect on *exchange rates*, and this effect can happen quite quickly.

If there are few, if any, suitable *alternatives* to the *imported good*, and if that *good* is needed (for example, a component for the braking system of a car), then the importer is obliged to buy it, even at a higher *post-tariff price*. That increases the *costs to US businesses*, so eroding *profitability*, even if some of the increased *cost* can be passed on as *price increases to consumers*.

A significant, and industry-wide, erosion of *profitability* (as could well be the case if the *US tariffs* are applied across very many *imported goods*) will depress *share prices* and so *weaken confidence in the US economy* - a *weakness* aggravated by the uncertainty resulting from the *volatility of Donald Trump's decision-making*.

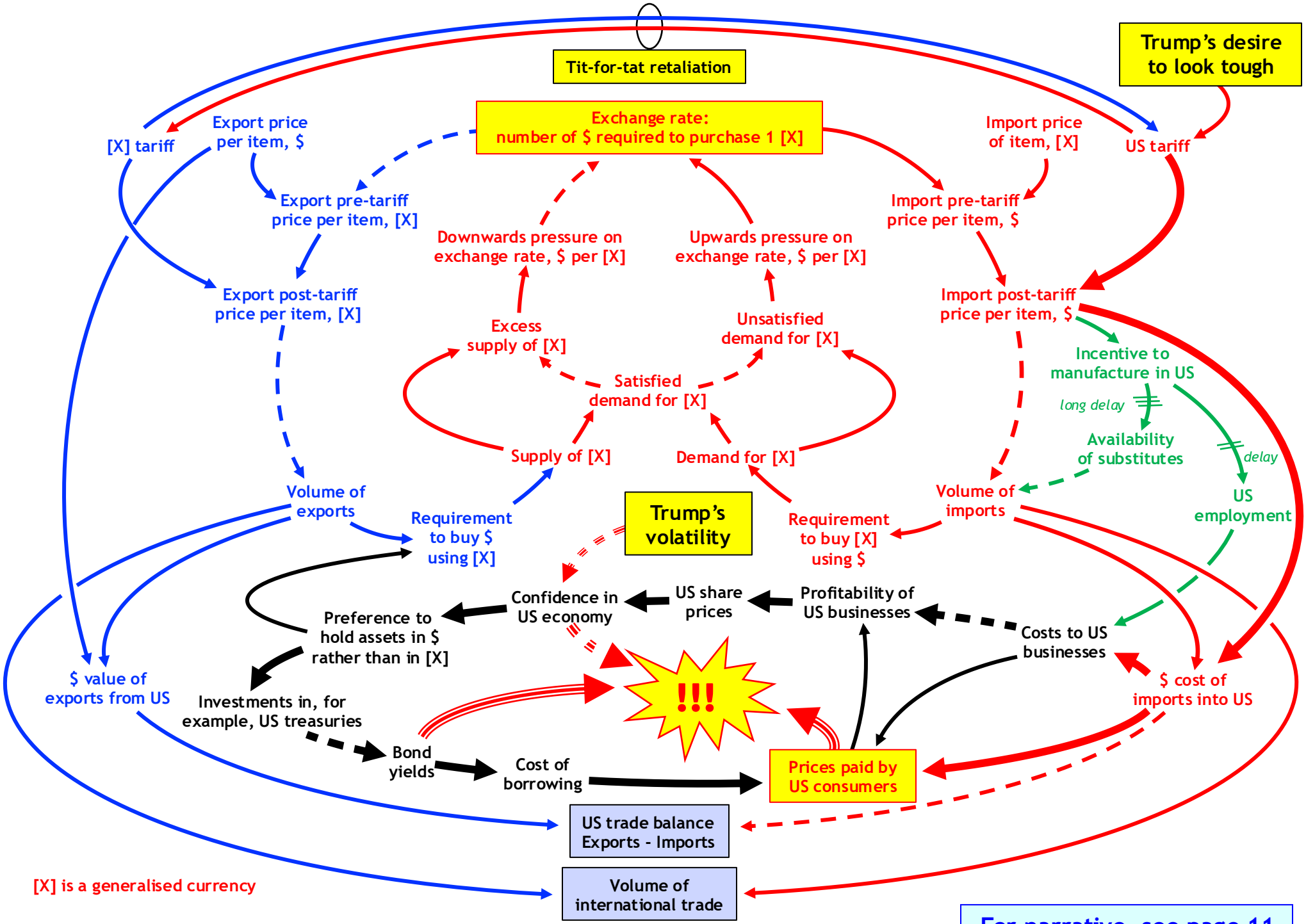
Investments in US businesses and securities will then be regarded as riskier, rather than safer, leading to a decline in investors' *preference to hold US assets*. These *assets* will then be sold, leading to a surplus of *$* which investors will seek to exchange for non-US assets, including non-US currencies.

In the international currency markets, this shift away from *US assets* will (significantly) reduce the *requirement to buy $ using [X]* - indeed, it will flip it around to a requirement to by [X] using $.

The causal loop diagram on page 8, however, can take this into account. A fall in the *requirement to buy $ using [X]* decreases the *supply of [X]* as more and more *[X]* is converted into *$*. This decreases the *satisfied demand for [X]* and increases the *unsatisfied demand for [X]*. This in turn increases the *upwards pressure on the $ to [X] exchange rate*, leading to a change in that *rate* from, say, *$0.5 per [X]* to, say, *$0.8 per [X]*.

Before the *US tariffs* were imposed, 100 [X] could be bought for $50.
With the *US tariffs in place*, those same 100 [X] require an expenditure of $80.
The *$* has therefore significantly weakened relative to the *[X]*. And quickly, too.

… and bond markets can fall



For narrative, see page 11

Narrative to page 10

The weakening of the *US $* is not the only negative consequence of the widespread imposition of *US tariffs*. Bond markets can crash too.

As discussed on the previous two pages, one consequence of the introduction of *tariffs* is to erode *confidence in the US economy*, and to diminish the *preference of investors to hold US assets*.

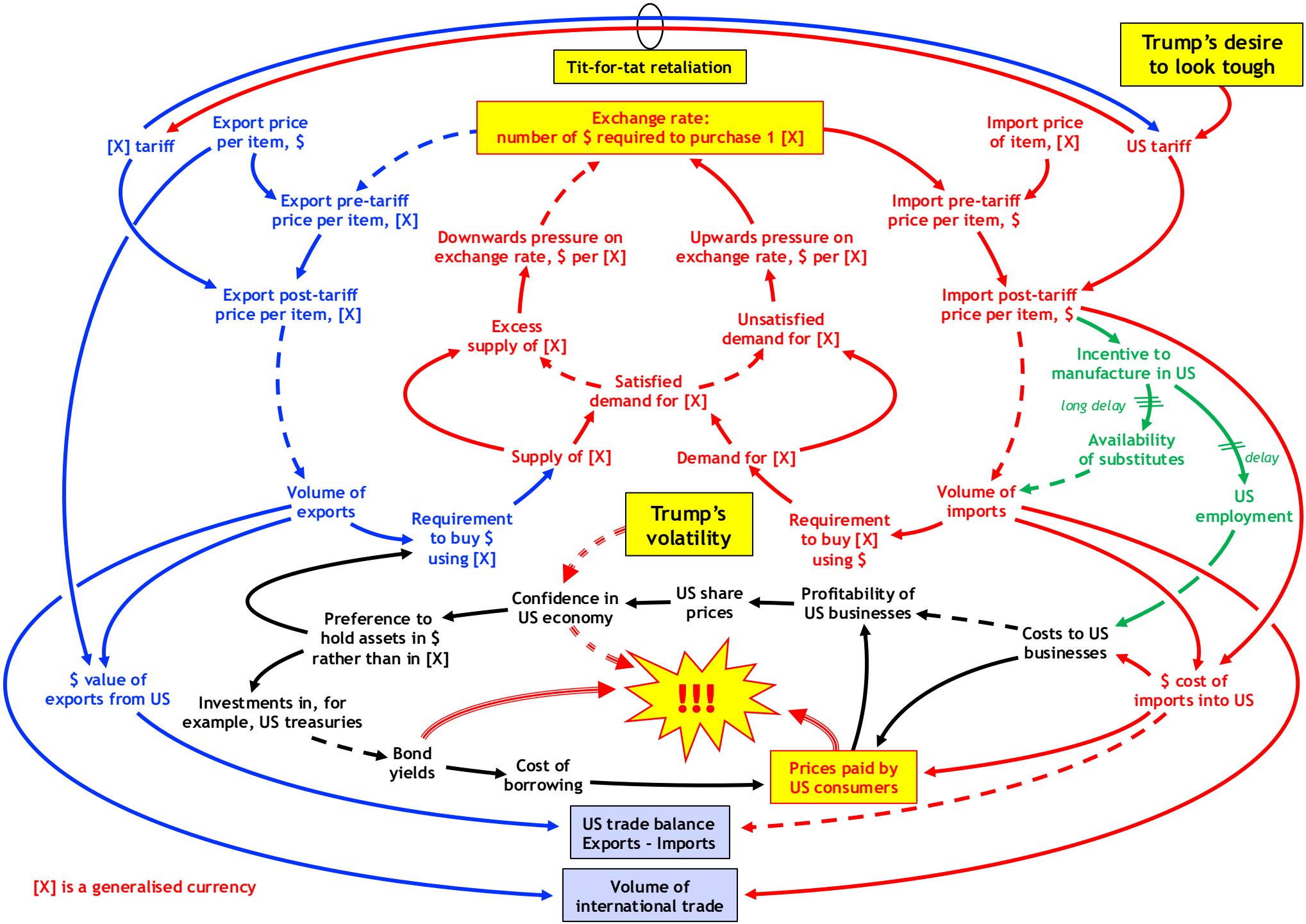
One (important) class of such *assets* is that of US treasury bonds. If *holding these bonds* is no longer attractive, investors will seek to sell them.

The cash generated will be in *US $*, some of which will be placed in the international currency markets to be exchanged for a different currency, one that is perceived to be safe, so driving the weakening of the *US $* as described on pages 9 and 10.

This selling will also drive down the bond price, resulting in an increase in *bond yields* and consequential upwards pressure on interest rates in general. This increased *cost of borrowing* will hit both the government and businesses (new borrowing will be at higher rates), as well as ordinary consumers (not least as a result of increased mortgage rates).

Overall, this can be highly damaging.

What a mess...


Tit-for-tat retaliation
Trump's desire to look tough
[X] tariff
Export price per item, $
Exchange rate: number of $ required to purchase 1 [X]
Import price of item, [X]
US tariff
Export pre-tariff price per item, [X]
Downwards pressure on exchange rate, $ per [X]
Upwards pressure on exchange rate, $ per [X]
Import pre-tariff price per item, $
Export post-tariff price per item, [X]
Import post-tariff price per item, $
Excess supply of [X]
Unsatisfied demand for [X]
Incentive to manufacture in US
Satisfied demand for [X]
long delay
Availability of substitutes
delay
Supply of [X]
Demand for [X]
Volume of exports
Volume of imports
US employment
Trump's volatility
Requirement to buy $ using [X]
Requirement to buy [X] using $
Confidence in US economy
US share prices
Profitability of US businesses
Preference to hold assets in $ rather than in [X]
Costs to US businesses
$ value of exports from US
!!!
$ cost of imports into US
Investments in, for example, US treasuries
Bond yields
Cost of borrowing
Prices paid by US consumers
US trade balance Exports - Imports
[X] is a generalised currency
Volume of international trade

The systems perspective

The ‘systems perspective’ facilitates our exploration of complex systems, both as regards enriching our understanding of existing systems, as well as informing our ability to design effective new ones.

The central feature of the systems perspective is the willingness - or rather the obligation - to take a ‘whole system view, to examine the entire system regardless of organisational, geographical or temporal boundaries. For only by examining systems holistically can we successfully anticipate, and so avoid:

- **‘quick fixes that backfire’**
- **‘unintended consequences’**
- **designing a system that merely shifts the problem from ‘here’ to ‘there’.**

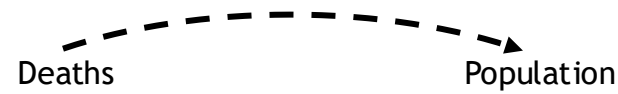
Furthermore, the systems perspective enables us to describe the structure of a system with great clarity, so helping us to communicate the essence of the system to others. This can be of enormous value in helping others to see how the system works, how they can work within it, and how best to intervene in the system wisely - three essential components in building their willingness to accept reality, and to agree on policies and actions for change.

The language of systems

Pages 14, 15 and 16 are for those unfamiliar with the tools and techniques associated with the systems perspective. Very briefly…

- **A 'system' is a 'community of connected entities'**, where the emphasis is on the connectedness between the entities, rather than on the entities themselves.
- **Systems show 'emergent behaviour'** - properties that exist at the level of the system, rather than at the level of the individual entities from which the system is composed. An example is the system "I went to the bank", in which the 'entities' are words in the English language, connected together to form the 'system' of a sentence. The meaning of the sentence is a property of the sentence as a whole - a meaning which cannot be inferred however hard we study any individual entity, such as the single word 'went'. The existence of emergent properties implies that systems must be studied as a whole.
- A powerful way of describing the structure of a system is by means of **'causal loop diagrams'** or 'influence diagrams'. These diagrams show 'chains of causality', which capture our belief that a given 'cause' drives a given 'effect'. This causal relationship is shown by connecting the 'cause' to the 'effect' with a link, represented by an arrow.
- If an increase in a 'cause' drives an increase in the corresponding 'effect', the link is known as a **direct link**, as indicated by a solid arrow (some sources associate the head of the arrow with a + sign, or the letter S, representing 'same', since the variables at the head and the tail of the link move in the same direction).

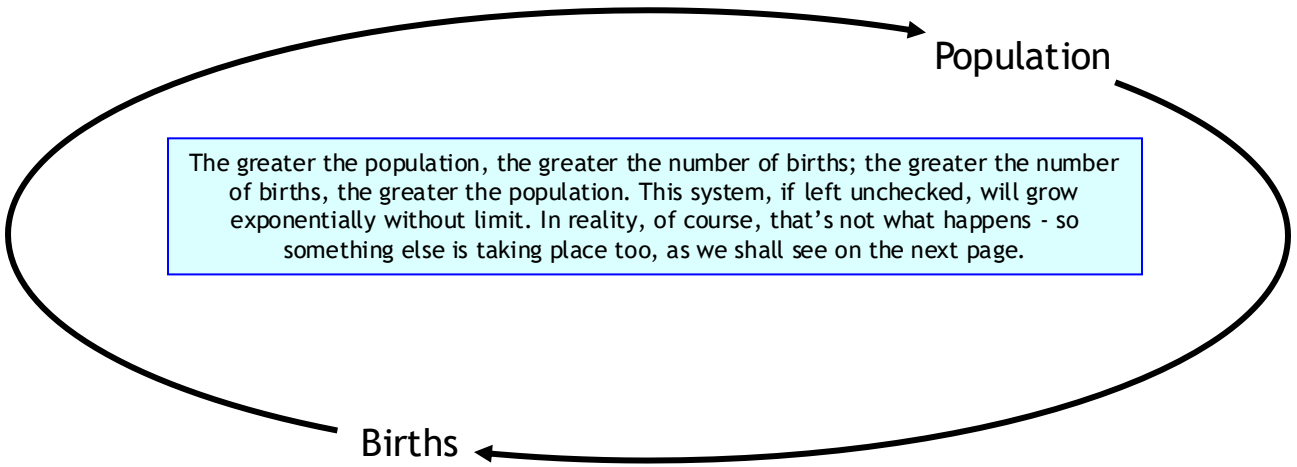
- If an increase in a 'cause' drives a decrease in the corresponding 'effect', the link is known as an **inverse link**, as indicated by a dashed arrow (some sources associate the head of the arrow with a – sign, or the letter O, representing 'opposite', since the variables at the head and the tail of the link move in opposite directions).



- Chains of causality usually form closed loops known as feedback loops; 'open-loop systems', chains of causality that do not form closed loops, are very rare, and are usually indicative of the likelihood that the description of the system under study is as yet incomplete. **Feedback loops are of two, and only two, fundamental types: reinforcing loops (see page 15) and balancing loops (see page 16).** Dynamically, a reinforcing loop exhibits either exponential growth or decline; a balancing loop either oscillates, stabilises on a target, or modifies the dynamic behaviour of an associated, linked loop - for example, by slowing the growth of a linked reinforcing loop.
- **Real systems are (often complex) networks of interconnecting reinforcing and balancing loops** (see, for example, page 12). Despite this complexity, great insight into the behaviour of a system as a whole can be deduced from the structure of its reinforcing and balancing components.

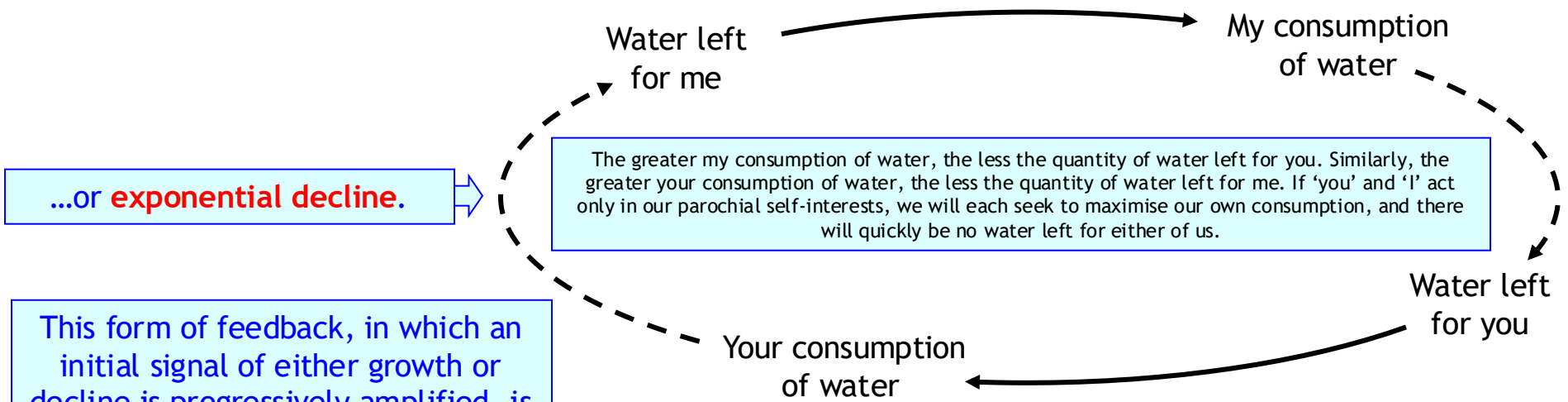
Reinforcing loops

Reinforcing loops are closed loops that contain an **even** number of inverse links (zero is an even number)…



The greater the population, the greater the number of births; the greater the number of births, the greater the population. This system, if left unchecked, will grow exponentially without limit. In reality, of course, that's not what happens - so something else is taking place too, as we shall see on the next page.

…and exhibit two forms of behaviour - either **exponential growth**…

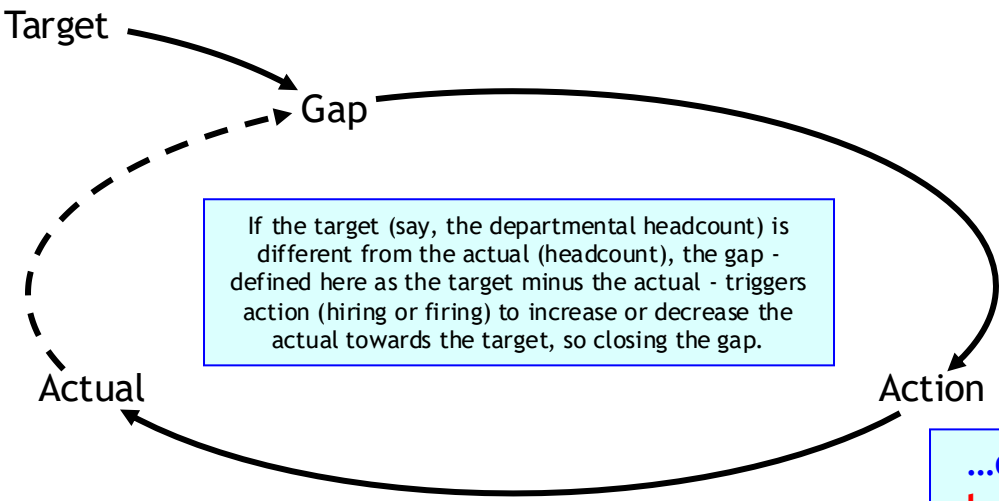


The greater my consumption of water, the less the quantity of water left for you. Similarly, the greater your consumption of water, the less the quantity of water left for me. If 'you' and 'I' act only in our parochial self-interests, we will each seek to maximise our own consumption, and there will quickly be no water left for either of us.

…or **exponential decline**.

This form of feedback, in which an initial signal of either growth or decline is progressively amplified, is known as **positive feedback**.

Balancing loops

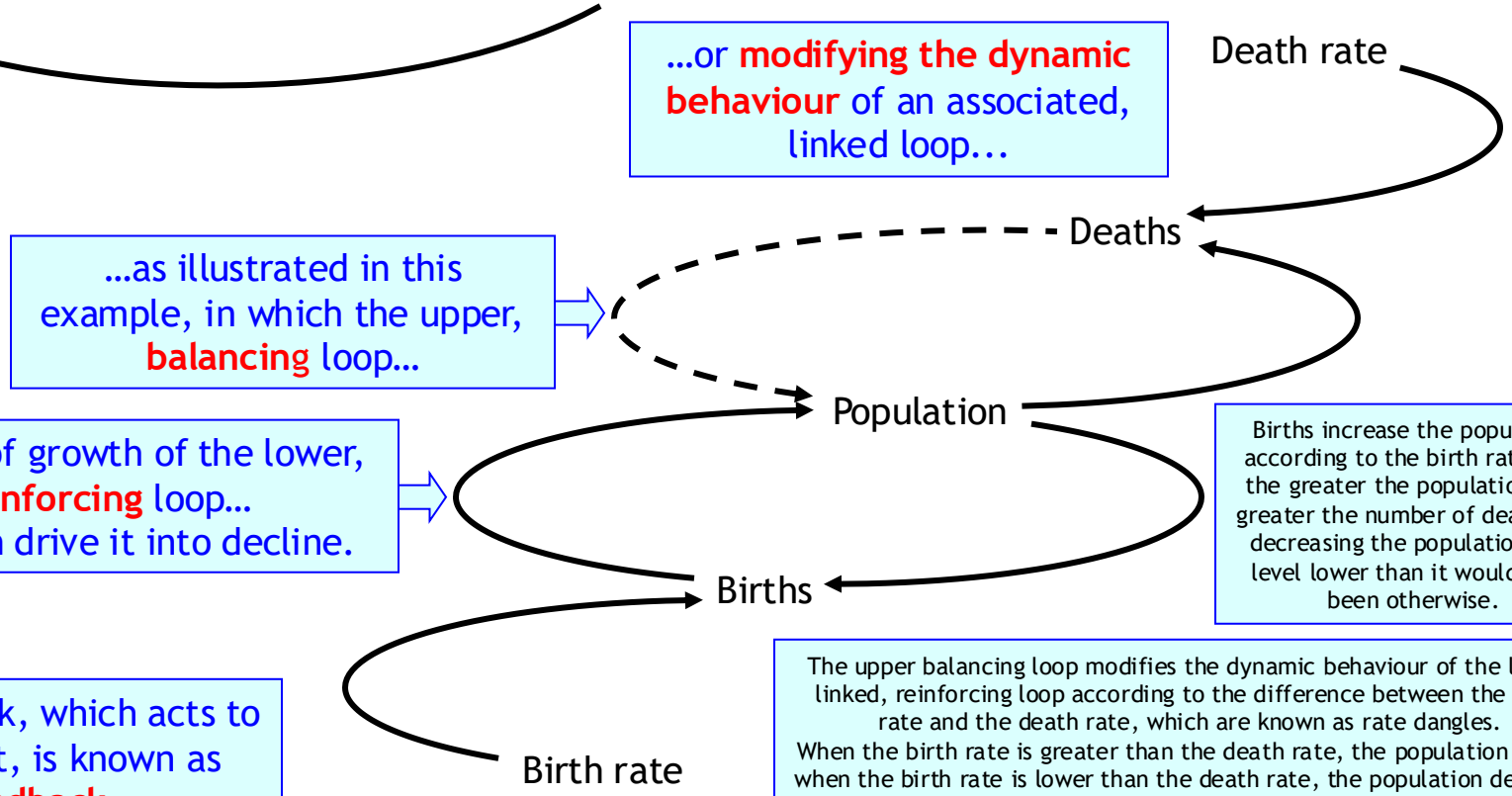


Balancing loops are closed loops that contain an **odd** number of indirect links, and most commonly exhibit two forms of behaviour…

If the target (say, the departmental headcount) is different from the actual (headcount), the gap - defined here as the target minus the actual - triggers action (hiring or firing) to increase or decrease the actual towards the target, so closing the gap.

…either **converging, and ultimately stabilising, on a target**, as determined by a **target dangle**…

…or **modifying the dynamic behaviour** of an associated, linked loop...



…as illustrated in this example, in which the upper, **balancing** loop…

…slows the rate of growth of the lower, linked, **reinforcing** loop…
…and might even drive it into decline.

Births increase the population according to the birth rate. But the greater the population, the greater the number of deaths, so decreasing the population to a level lower than it would have been otherwise.

This form of feedback, which acts to stabilise or to limit, is known as **negative feedback**.

The upper balancing loop modifies the dynamic behaviour of the lower, linked, reinforcing loop according to the difference between the birth rate and the death rate, which are known as rate dangles.
When the birth rate is greater than the death rate, the population grows; when the birth rate is lower than the death rate, the population declines; when the birth rate equals the death rate, the population is stable.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