
Making the whole greater than the sum of the parts

An analysis using systems thinking

The Silver Bullet Machine Manufacturing Company Limited

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These slides comprise a series of ‘causal loop diagrams’: representations of chains of cause-and-effect relationships which underpin what happen when two entities - called ‘Red’ and ‘Blue’ - compete for the same resources. These resources can be anything from people to funds, from access to clients to the ear of the boss, from water to land.

The intention of these diagrams is to capture the essence of how the competition for the same resource evolves, and where that competition might lead. As will be seen, there are three possible outcomes: which one do you prefer?

In that these diagrams represent a generalised situation, they should contain no surprises. But that doesn’t stop them from being extremely powerful - what other ways are there of representing the business as a whole, rather than as an aggregate of separate bits?

These diagrams are representative of a technique known as ‘systems thinking’, which encourages a holistic approach to addressing and solving complex problems, and can be used as a basis for computer simulation modelling of how we can best grow a business.

Although all businesses are complex, this complexity can be tamed. So these diagrams are not trivial, and require some concentration. But they are not incomprehensible. Indeed, you may judge whether or not they truly ‘see the wood for the trees’.

Systems thinking and system dynamics - the benefits

- **Systems thinking can help you tame the complexity of real world problems** by providing a structured way of balancing a broad, complete view with the selection of the right level of detail, truly **allowing you to ‘see the wood for the trees’**.
- **Causal loop diagrams** - a visual method of capturing this now-tamed complexity - **are a powerful means of communication**, and their use can ensure that as wide a community as you wish have a genuinely, and deeply, shared view. **This is enormously valuable in building high-performing teams.**
- **Causal loop diagrams can also help you identify the wisest way of influencing the system of interest.** As a result, you can avoid taking poor decisions - for example, decisions that look like quick- fixes, but are likely to backfire.
- **System dynamics modelling** is a computer modelling technique that allows you to simulate how a complex system, as expressed as a causal loop diagram, is likely to evolve over time. **This provides you with a ‘laboratory of the future’, so that you can test the likely consequences of actions, decisions or policies before you are obliged to commit.**
- **Overall, systems thinking can help you take decisions that pass the most stringent test there is - the test of time.**

The language of systems

Pages 3, 4 and 5 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 an arrow:



- If an *increase* in a 'cause' drives an *increase* in the corresponding 'effect', the tail of the arrow is associated with an *S* or a + sign. The *S* stands for 'same', since the variables at each end of the arrow move in the same direction:



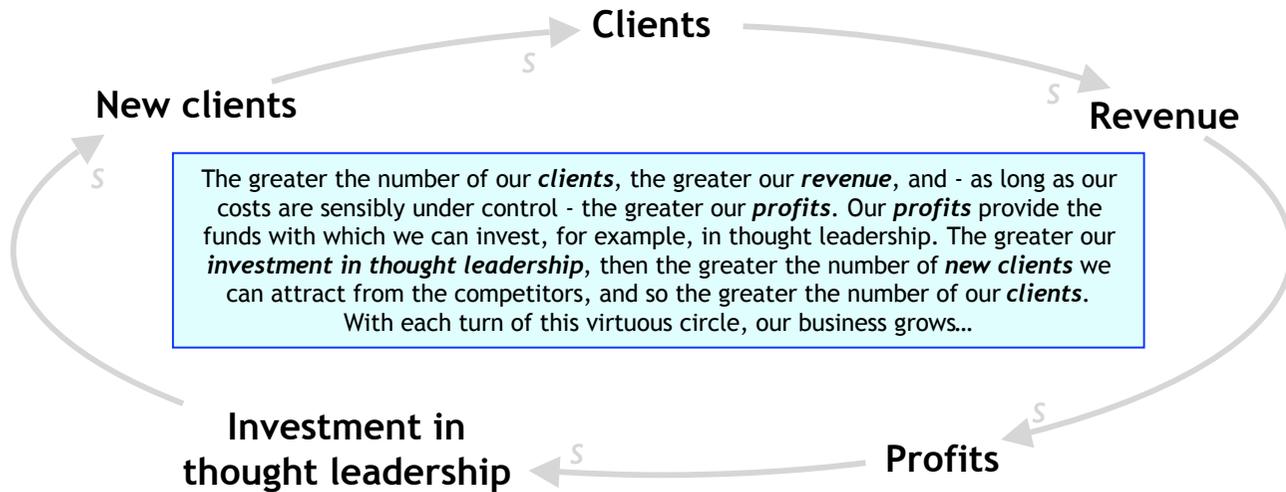
- If an *increase* in a 'cause' drives a *decrease* in the corresponding 'effect', the tail of the arrow is associated with an *O* or a - sign. The *O* stands for 'opposite', since the variables at each end of the arrow move in opposite directions:



- Chains of causality usually form closed loops known as *feedback loops*; "open-loop systems", chains of causality that do not form closed loops, are 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 4) and balancing loops (see page 5). Dynamically, reinforcing loops exhibit either exponential growth or decline; balancing loops either slow down an associated reinforcing loop, or stabilise on a target.
- Real systems are (often complex) networks of interconnecting reinforcing and balancing loops (see, for example, page 27). 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.

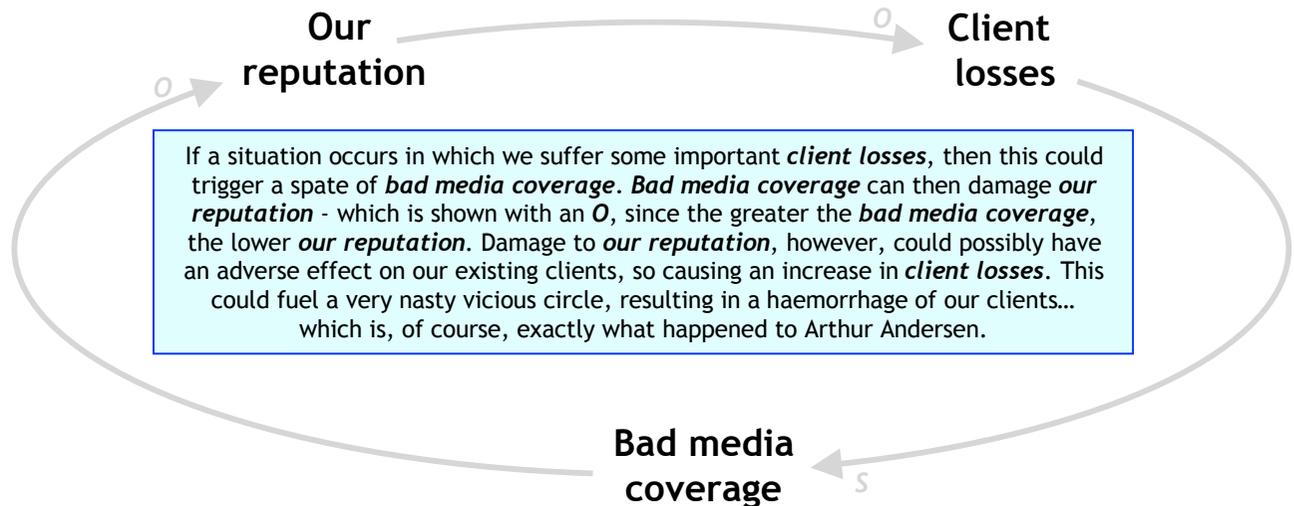
Reinforcing loops

Reinforcing loops are closed loops that contain an even number of O's (zero is an even number)...

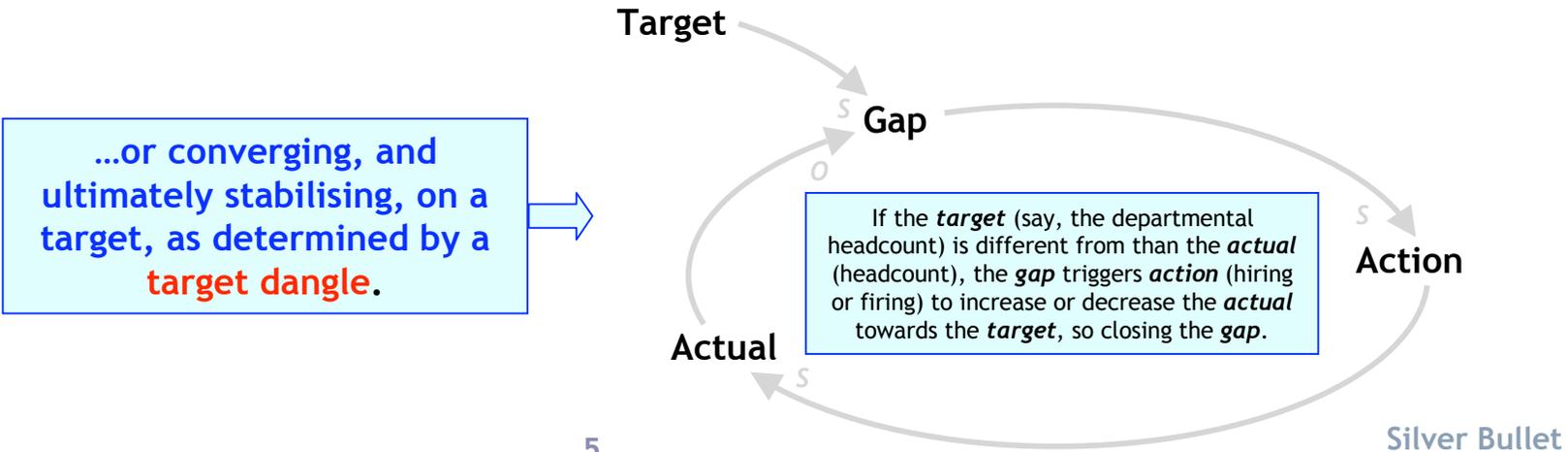
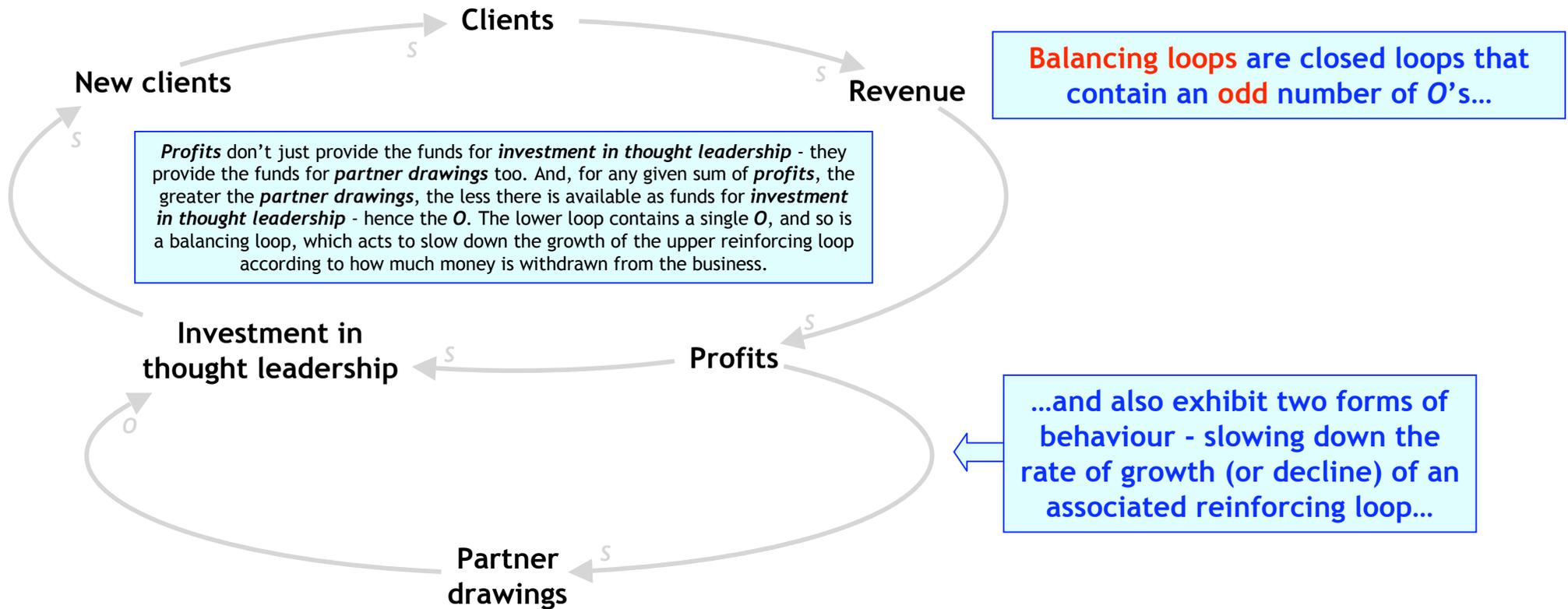


...and exhibit two forms of behaviour - exponential growth...

...or exponential decline...



Balancing loops



The following pages tell a story. A story about two people, **Red** and **Blue**, who work in their respective organisations. And like all good managers, **Red** and **Blue** are striving to meet their targets.

The story that unfolds describes, in the language of systems thinking and causal loop diagrams, what might happen. As you read the story, you might like to consider:

- whether or not the story makes sense
- and if it does, who **Red** and **Blue** might be.

You will also find that the story has three alternative endings.
Which ending do you prefer?

The *pressure on Red for growth* drives Red's demand for, and consumption of, resources.

Pressure on Red
for growth



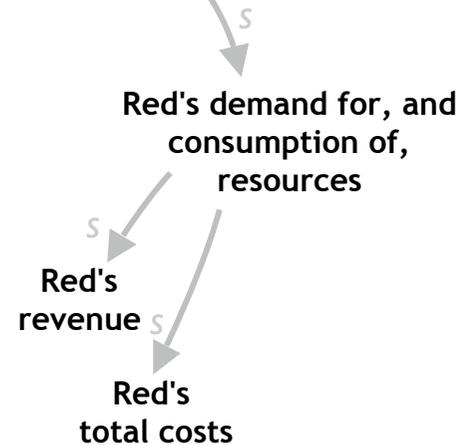
Red's demand for, and
consumption of,
resources

The S in the diagram stands for 'same', and indicates that the items at each end of the arrow move in the same direction: as the *pressure on Red for growth* increases, so does Red's demand for, and consumption of, resources.

Note: Throughout this document, we are using the term 'resources' very widely, to represent *any* resource required by the business to grow. This therefore includes:

- staff
- intellectual property
- physical plant and infrastructure assets
- products and services to sell
- clients, customers and markets to sell them to
- access to those clients, customers and markets
- funds for investment...

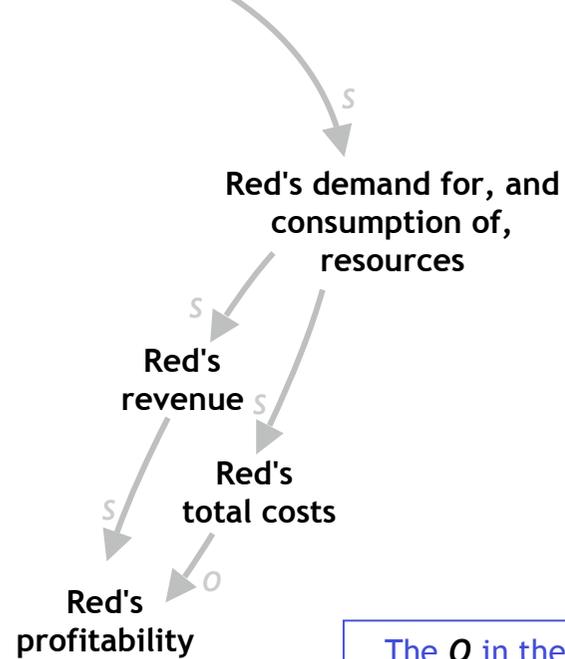
Pressure on Red
for growth



Red's demand for, and consumption of, resources drives Red's total costs (directly), and Red's revenue (ultimately).

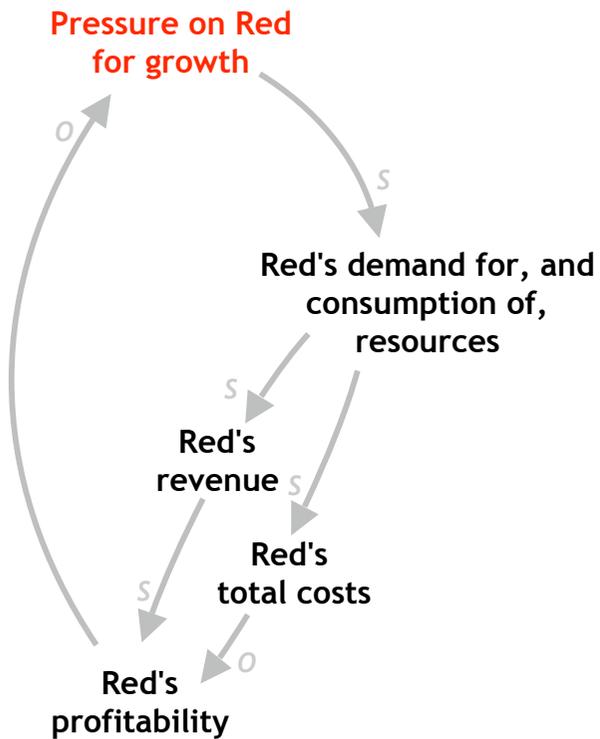
Note: The link between Red's demand for, and consumption of, resources and Red's revenue captures the idea, to take just a single example, that the greater the consumption of investment resources in product development, the greater the likelihood that we will have good products to sell, and so the more customers we will have, and the more revenue we will generate. There is much complexity here, but in the spirit of 'seeing the wood for the trees', the link, as shown, is in principle true.

Pressure on Red
for growth



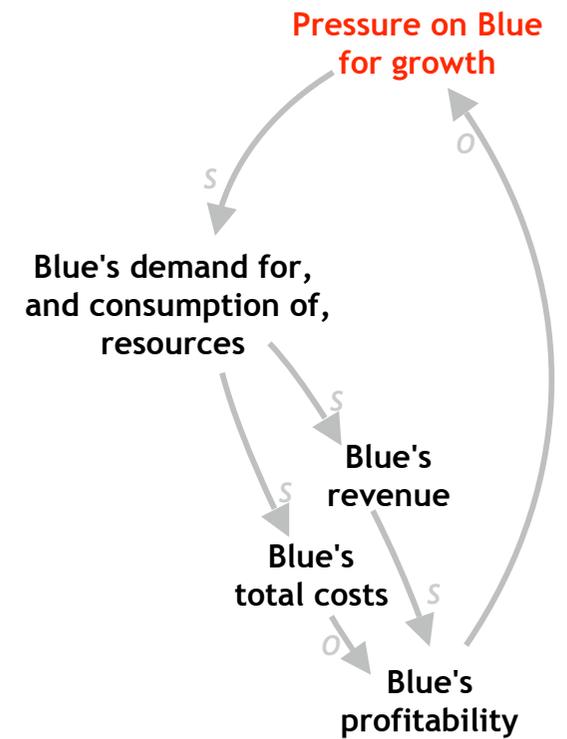
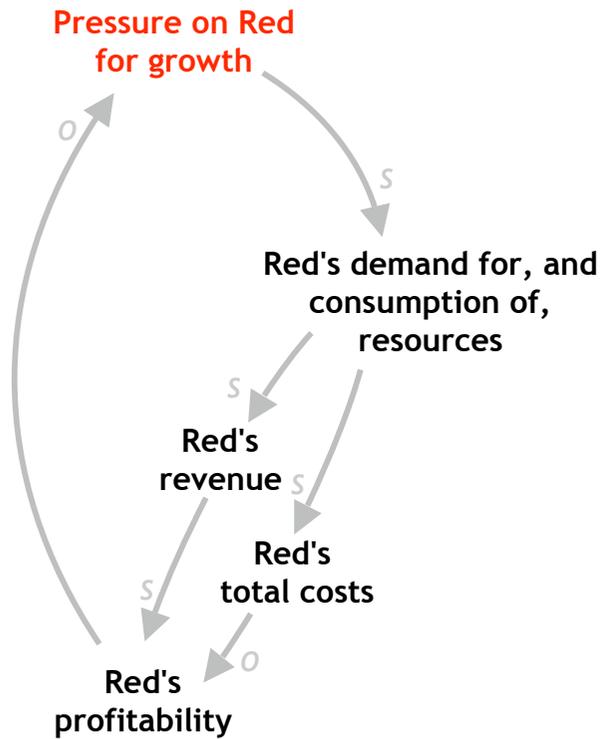
Red's total costs and Red's revenue combine to determine Red's profitability...

The **O** in the diagram stands for 'opposite', and indicates that the items at each end of the arrow move in opposite directions: as *Red's total costs increase*, *Red's profitability decreases*.

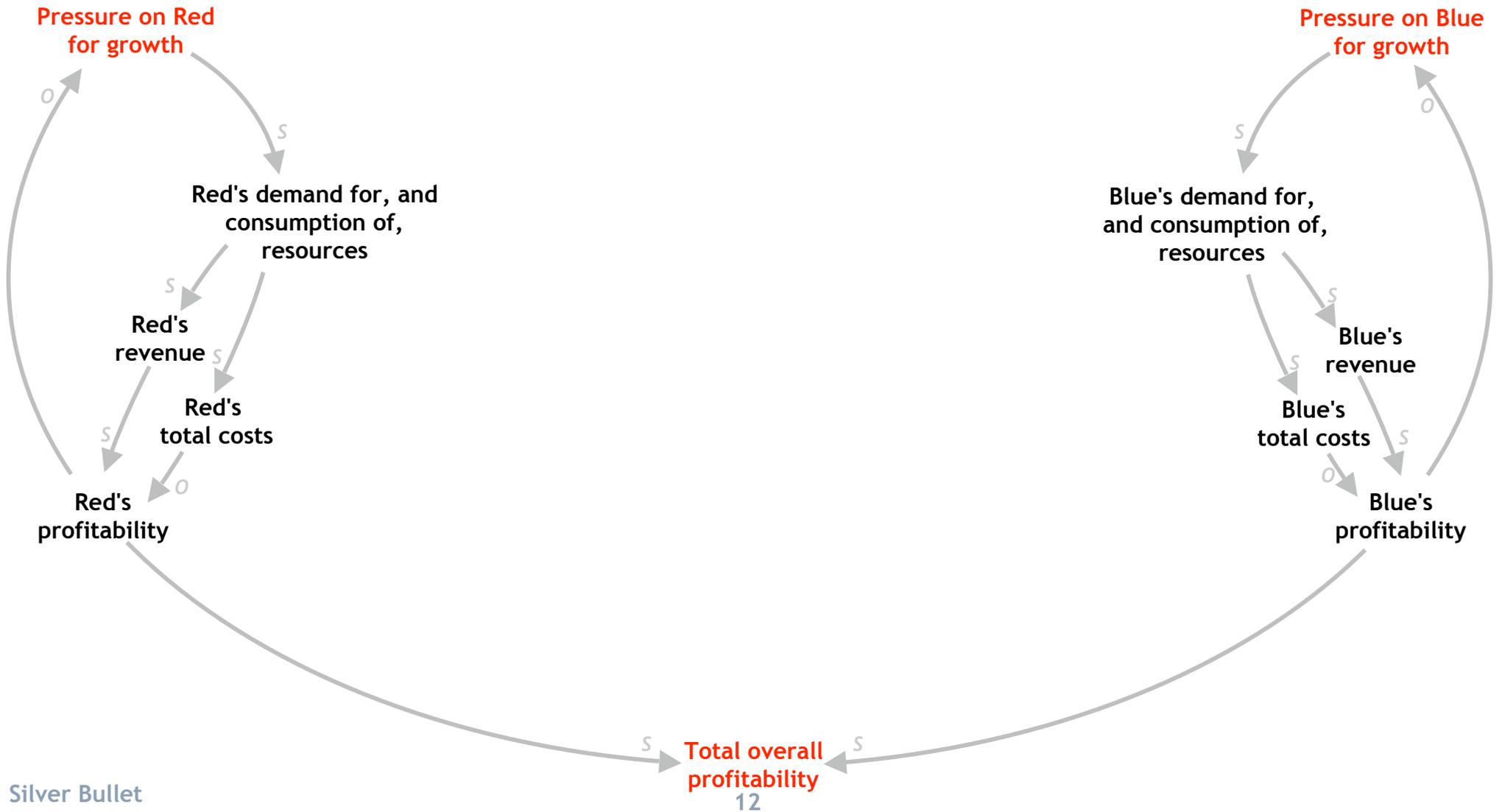


...and *Red's profitability* then feeds back to the *pressure on Red for growth*, in that, in general, the lower *Red's profitability*, the stronger the *pressure on Red for growth*.

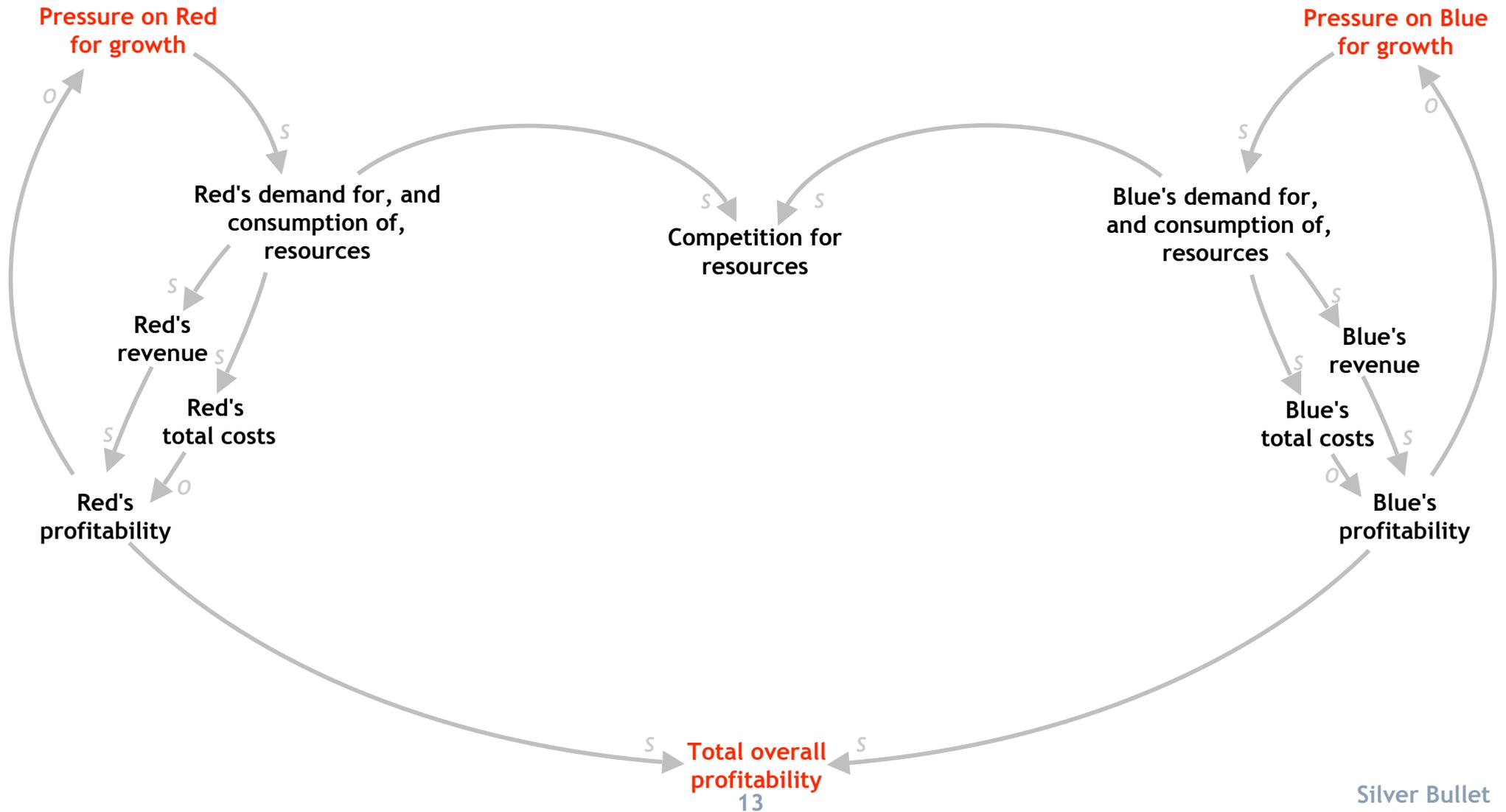
The situation for Blue is symmetrical...



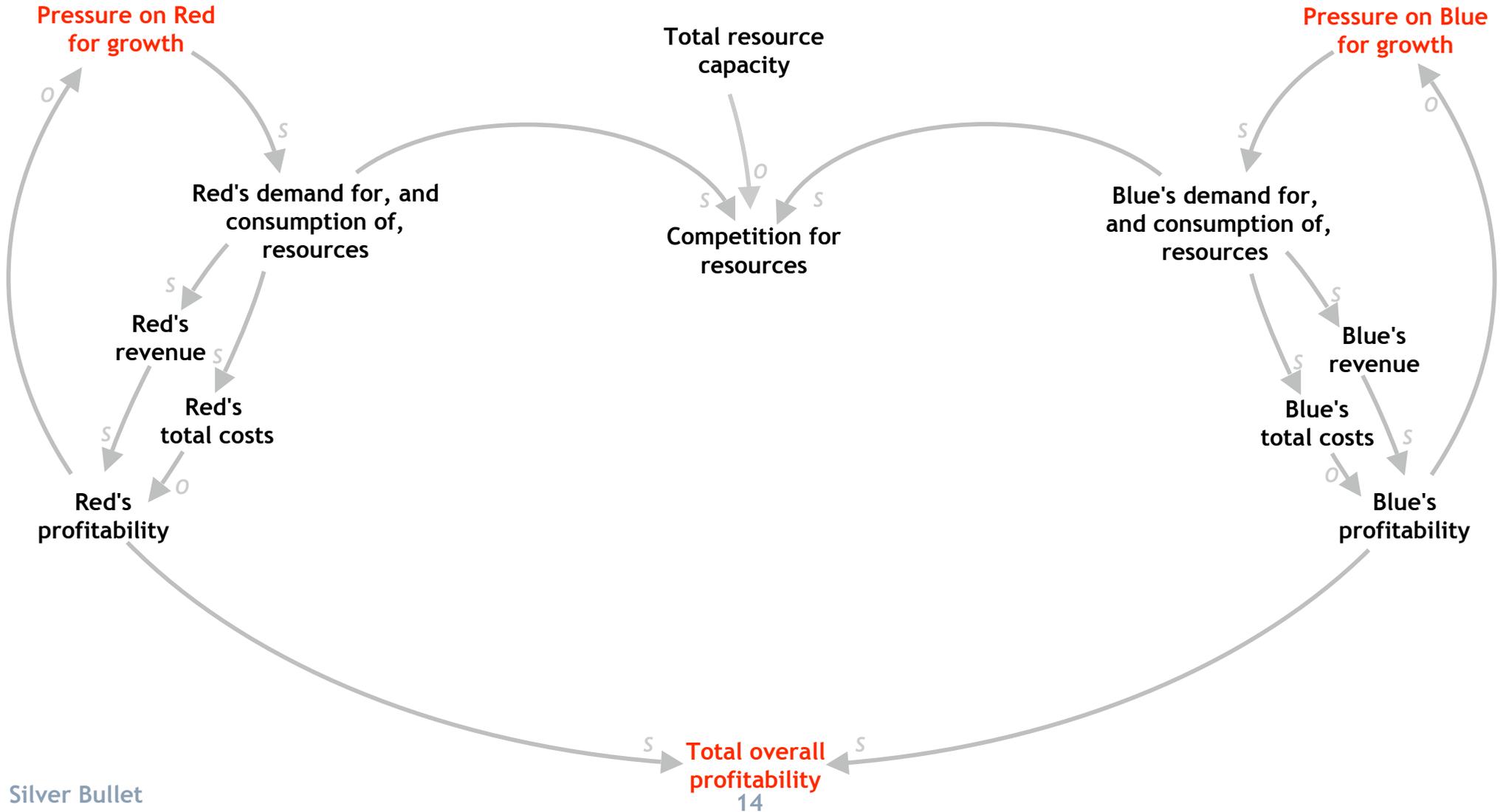
...with the **total overall profitability** being the sum of the profitabilities of the two businesses.

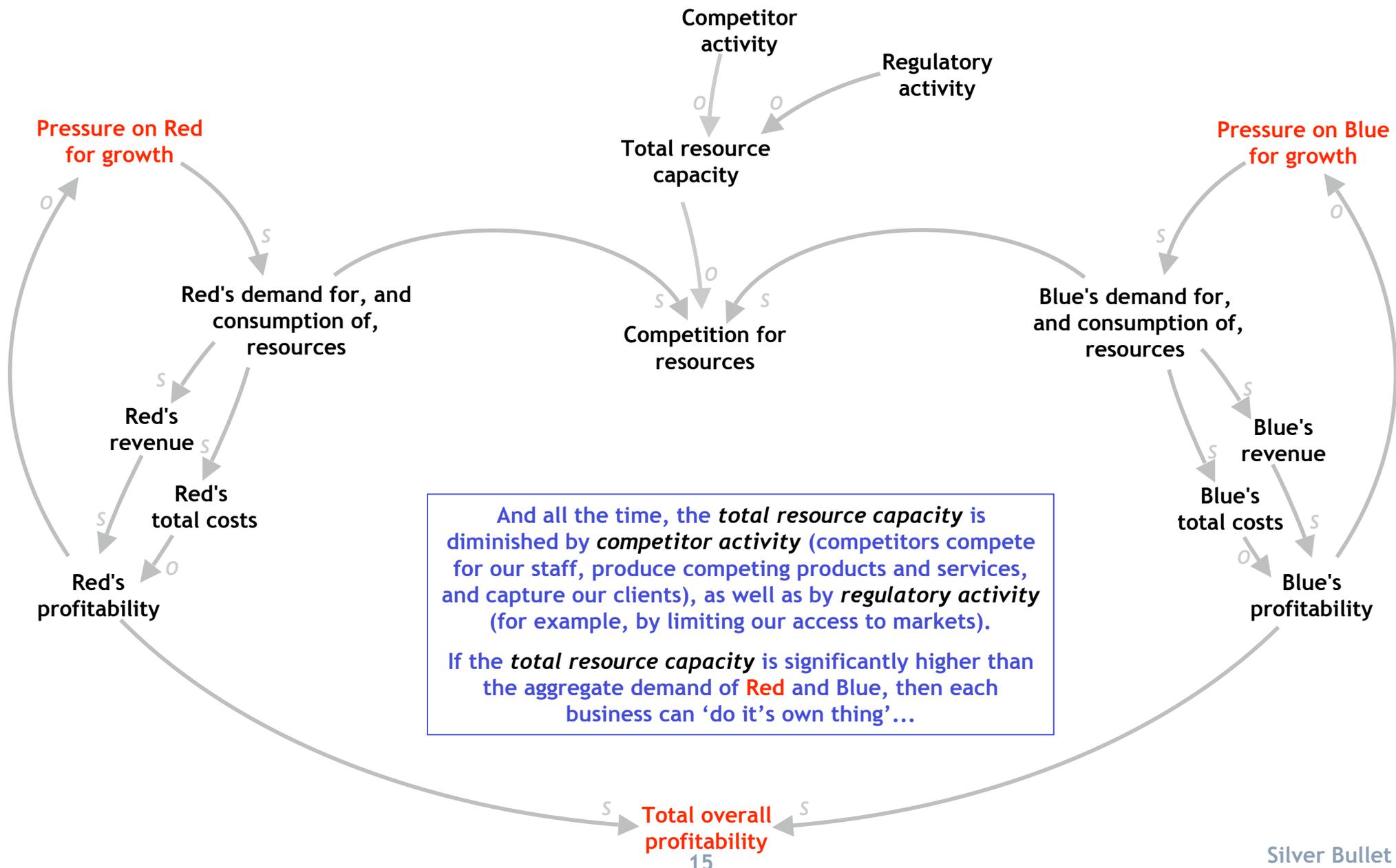


It may happen, however, that the activities of the two businesses cause *competition for resources*, for example, skilled staff, investment funds, or access to clients...

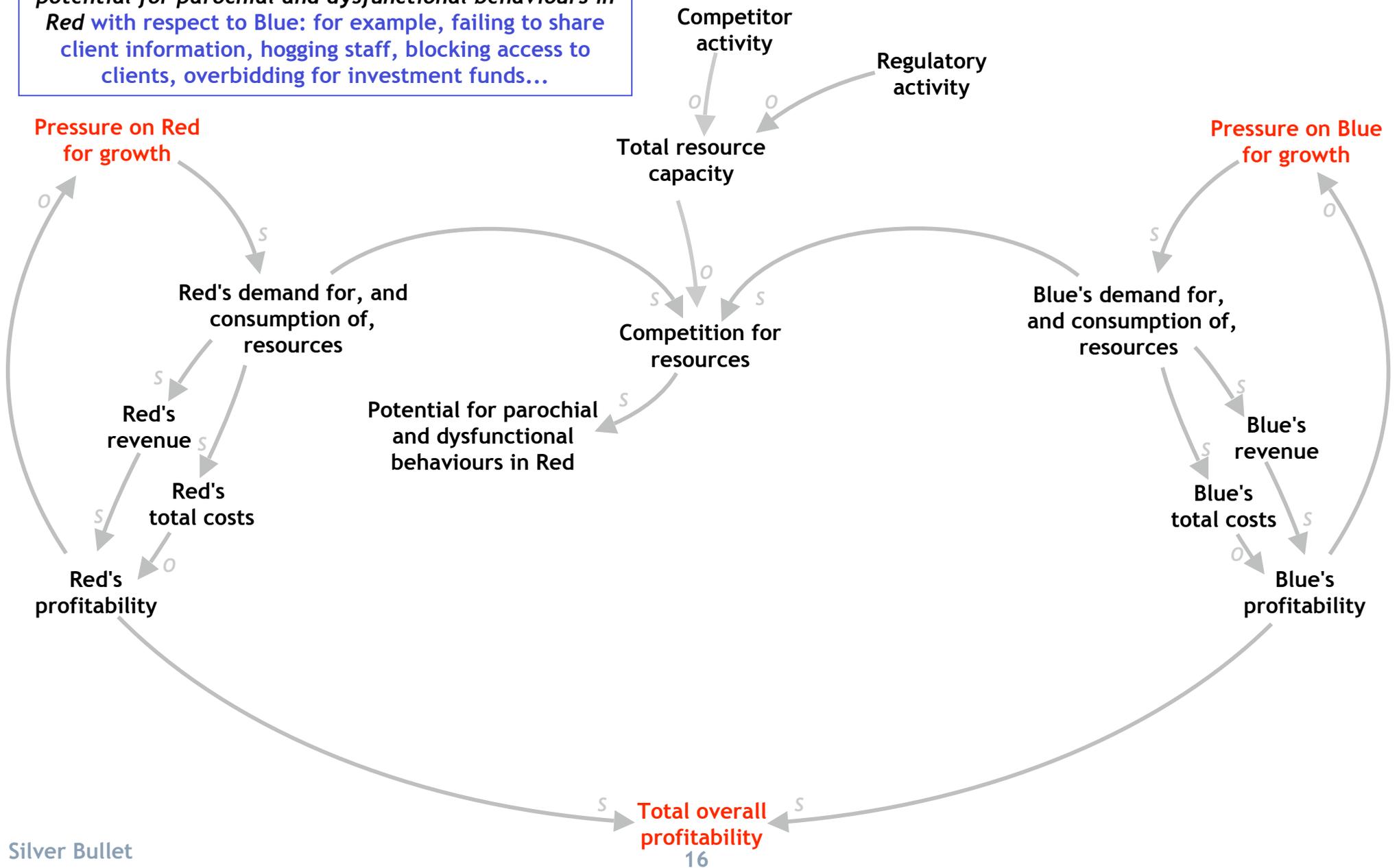


...for all these resources are finite, as measured by the relevant *total resource capacity*.

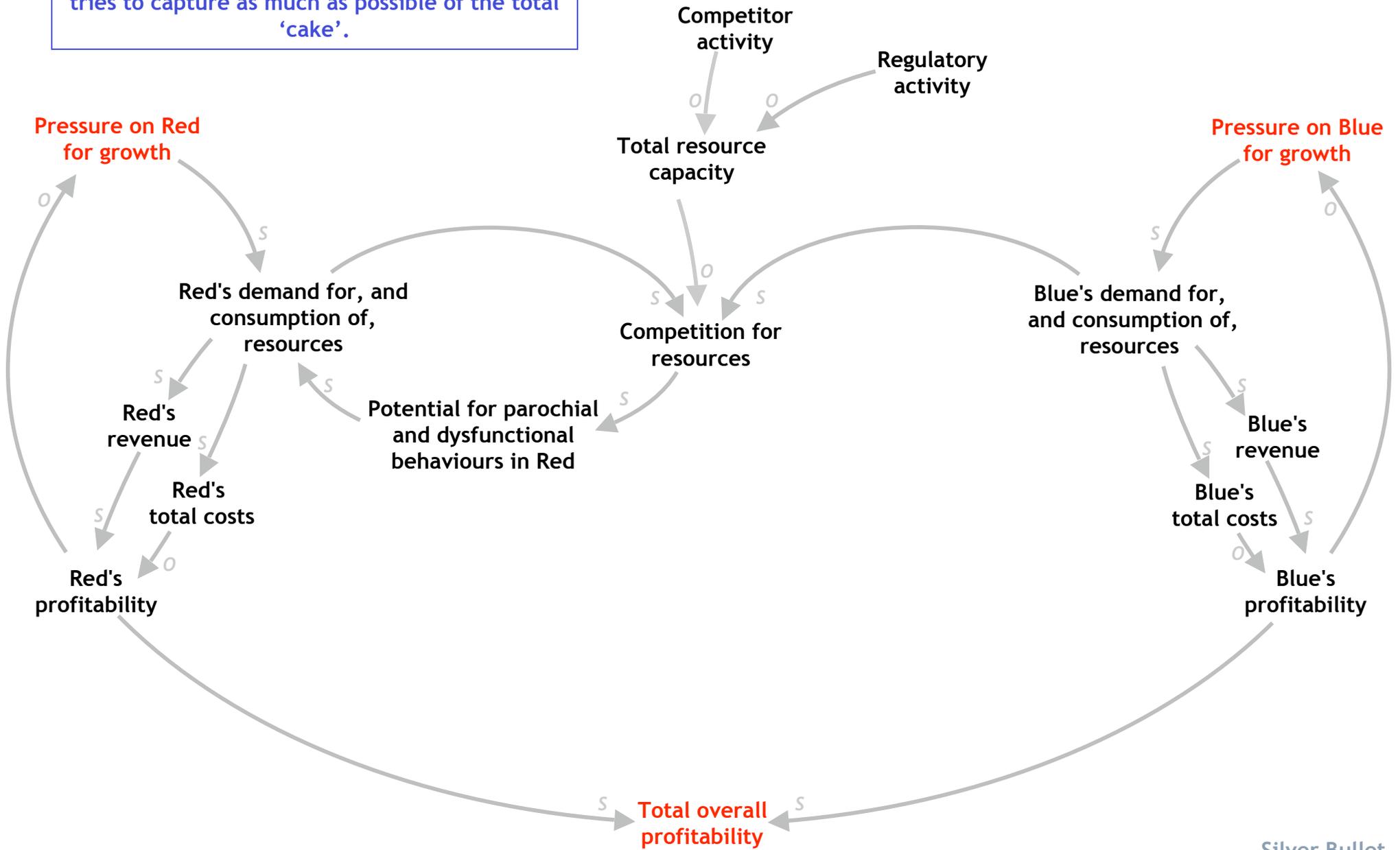




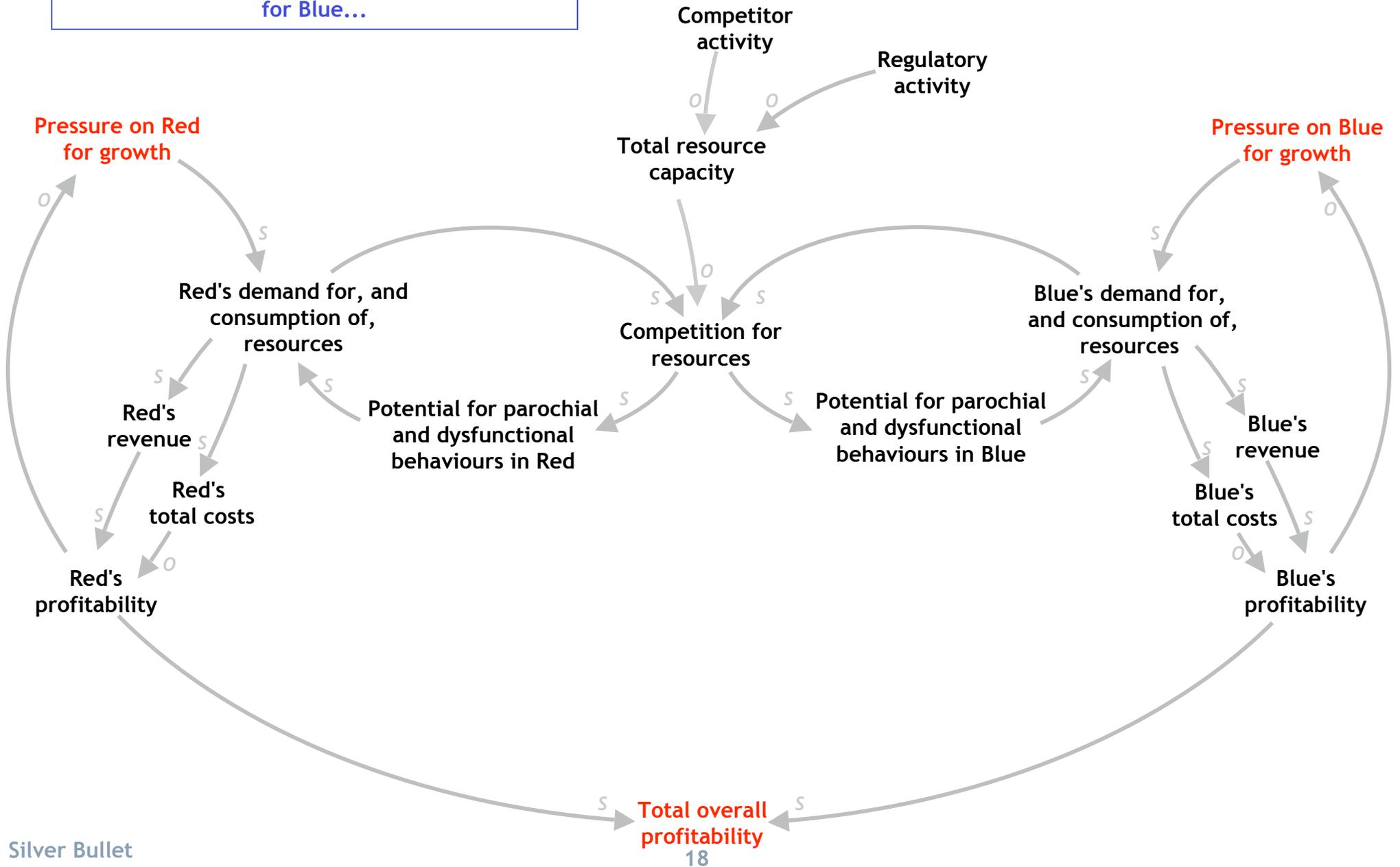
...but if Red feels that there is not enough *total resource capacity* for its own needs, this can lead to a *potential for parochial and dysfunctional behaviours in Red* with respect to Blue: for example, failing to share client information, hogging staff, blocking access to clients, overbidding for investment funds...



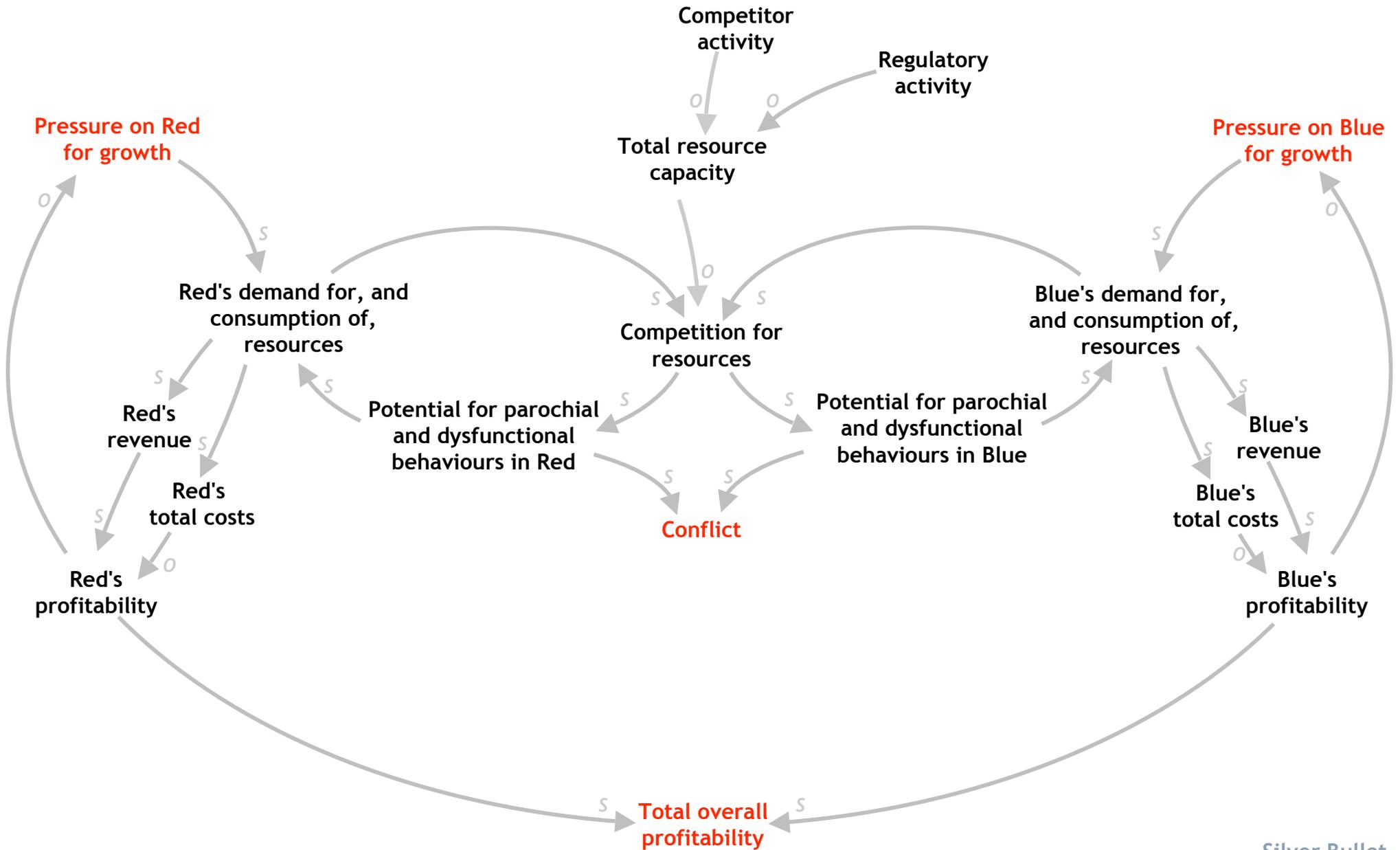
This in turn drives Red's demand for, and consumption of, resources as Red progressively tries to capture as much as possible of the total 'cake'.



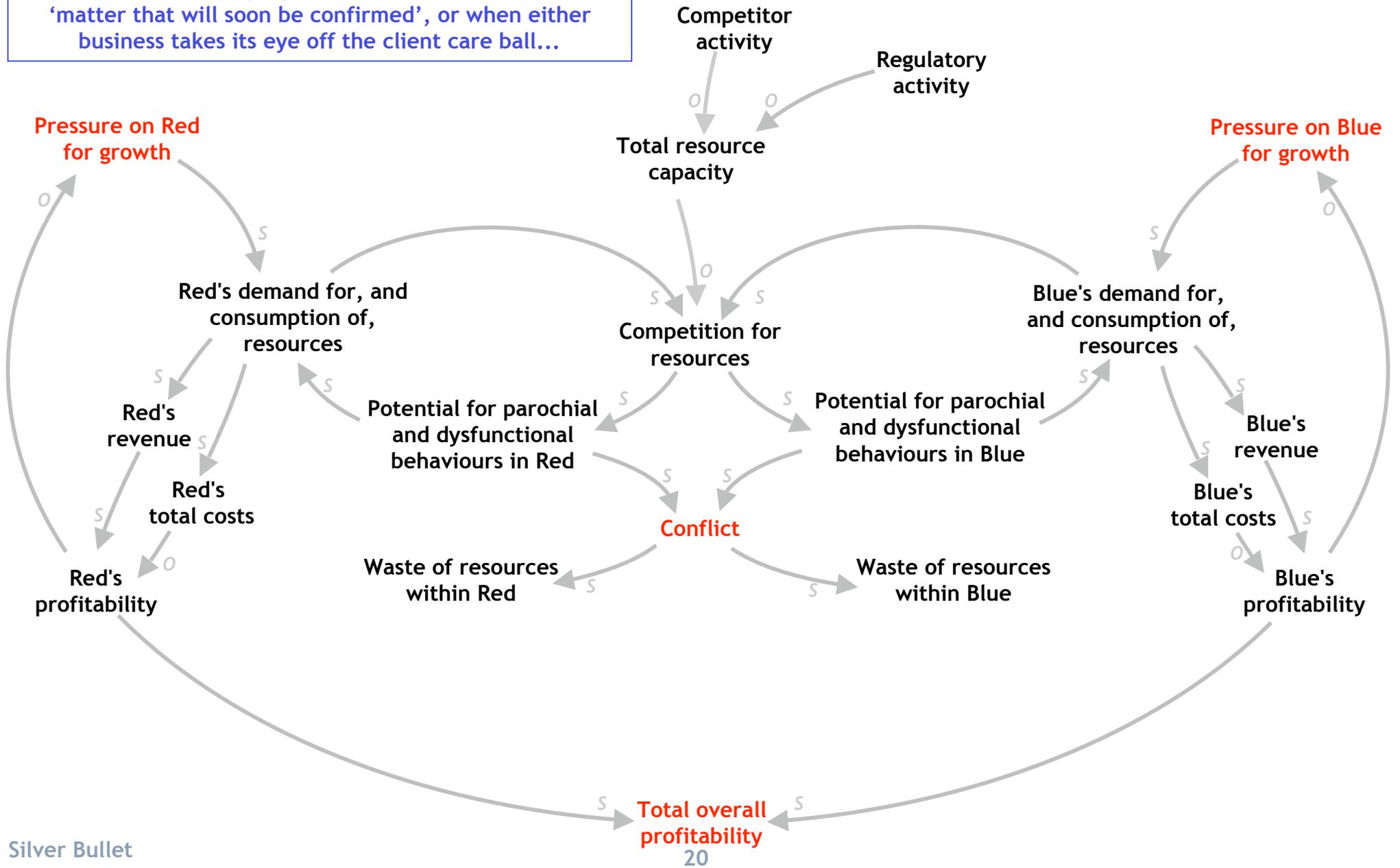
Meanwhile, exactly the same thing is happening for Blue...



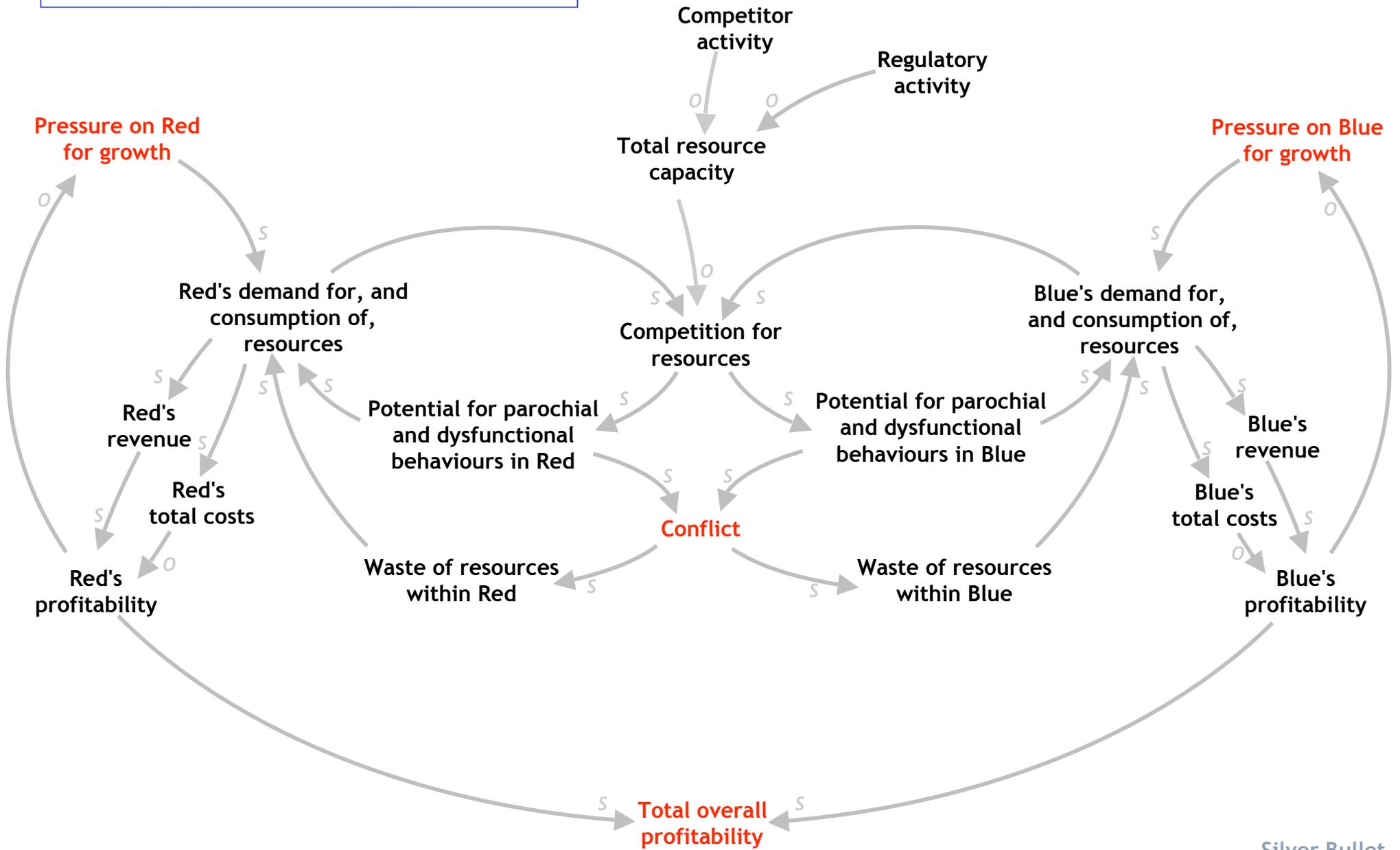
...sooner or later leading to *conflict*.



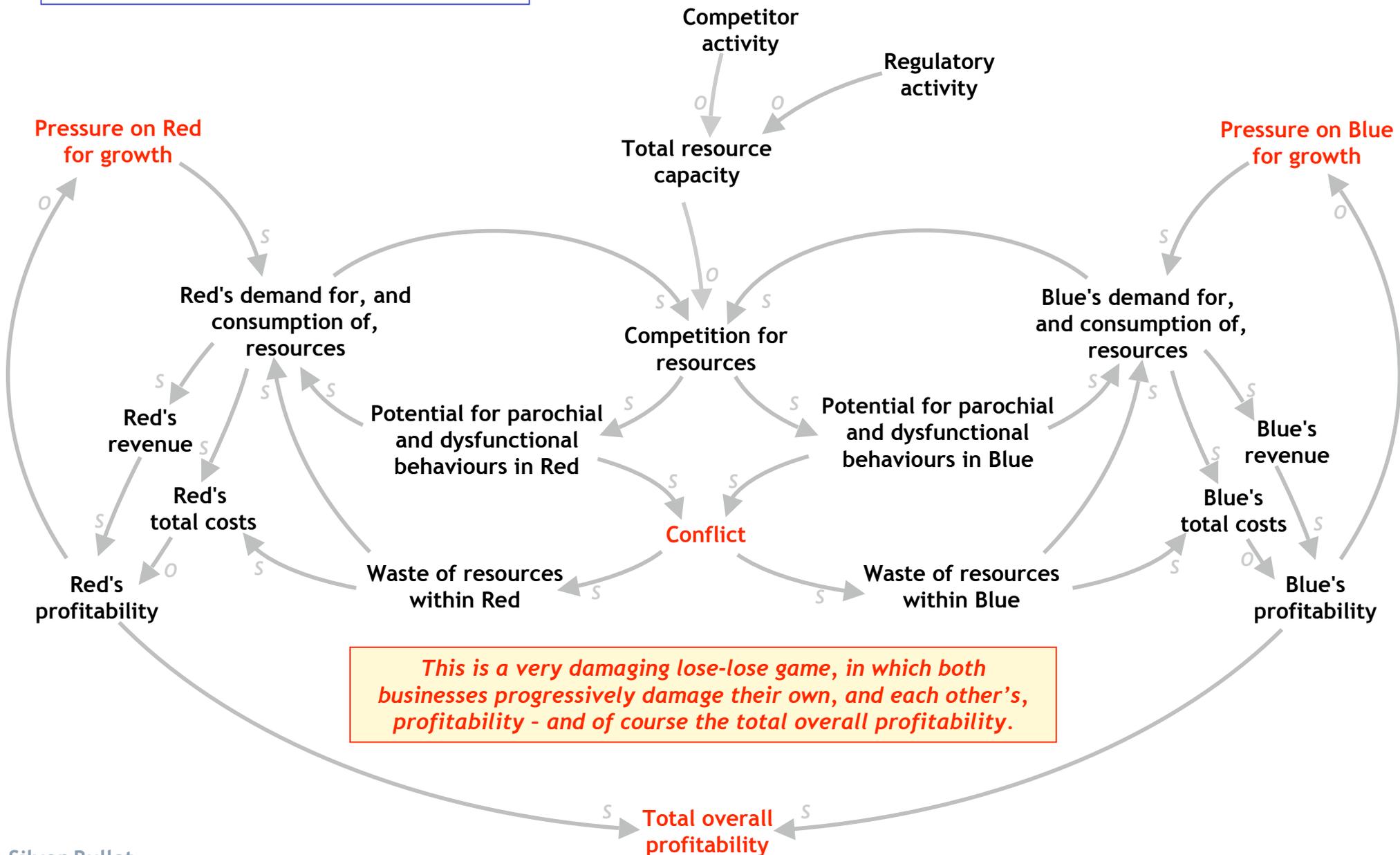
Conflict leads to a *waste of resources* within both Red and Blue, as time is wasted on internal arguments, or on keeping 'favourites' on standby for the 'matter that will soon be confirmed', or when either business takes its eye off the client care ball...



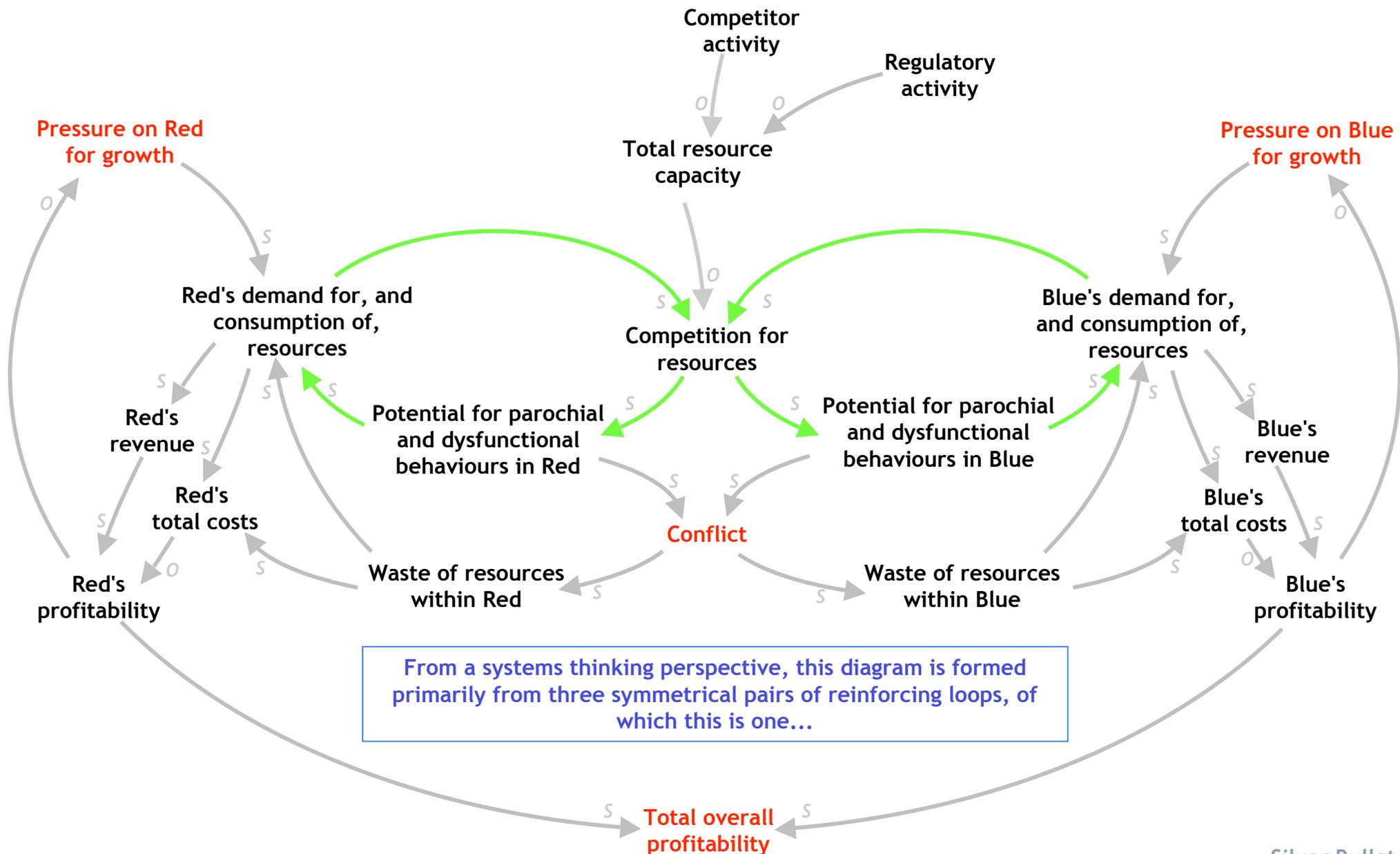
This in turn increases both Red's and Blue's demand for, and consumption of, resources...



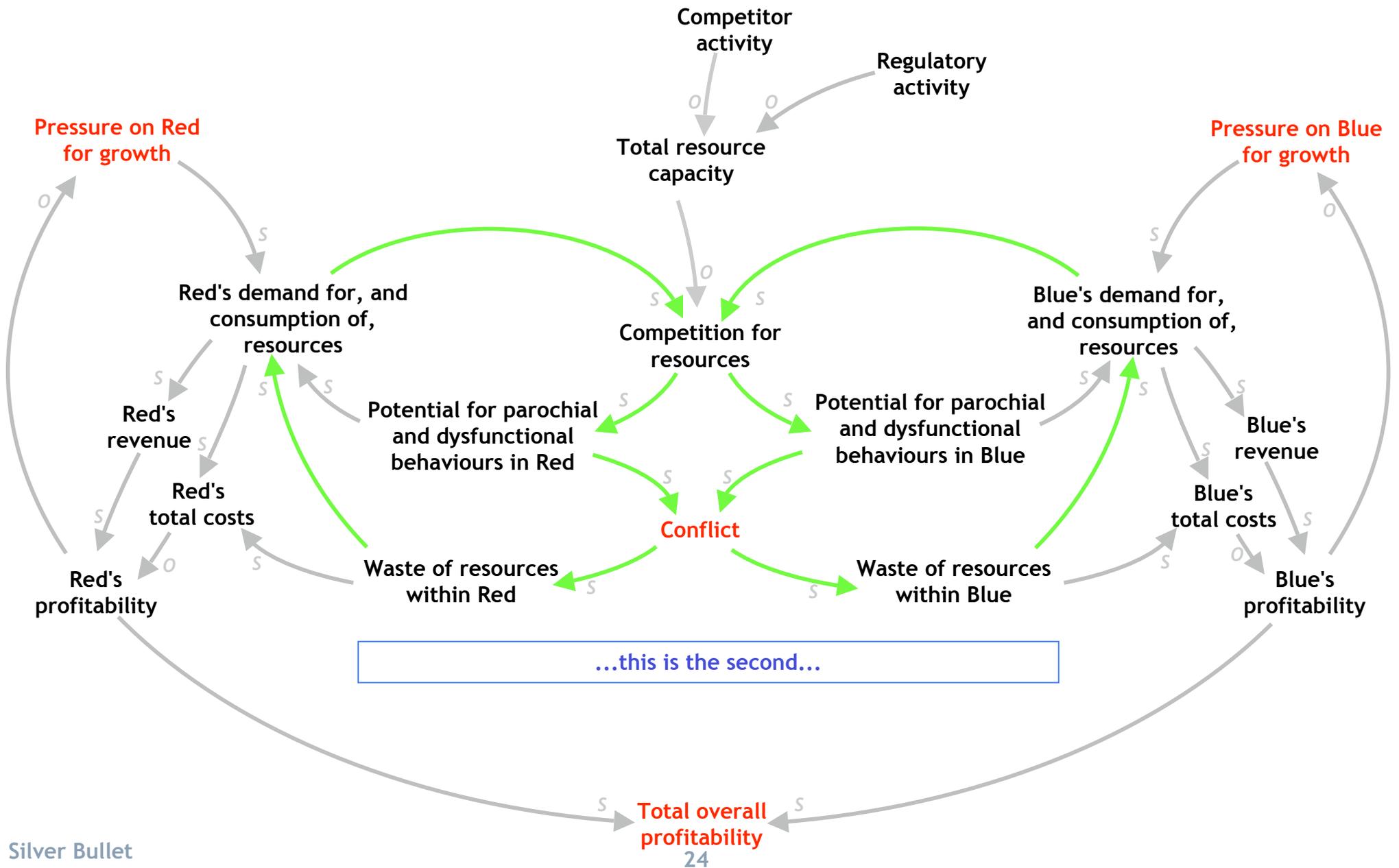
...as well as the two businesses' *total costs*.

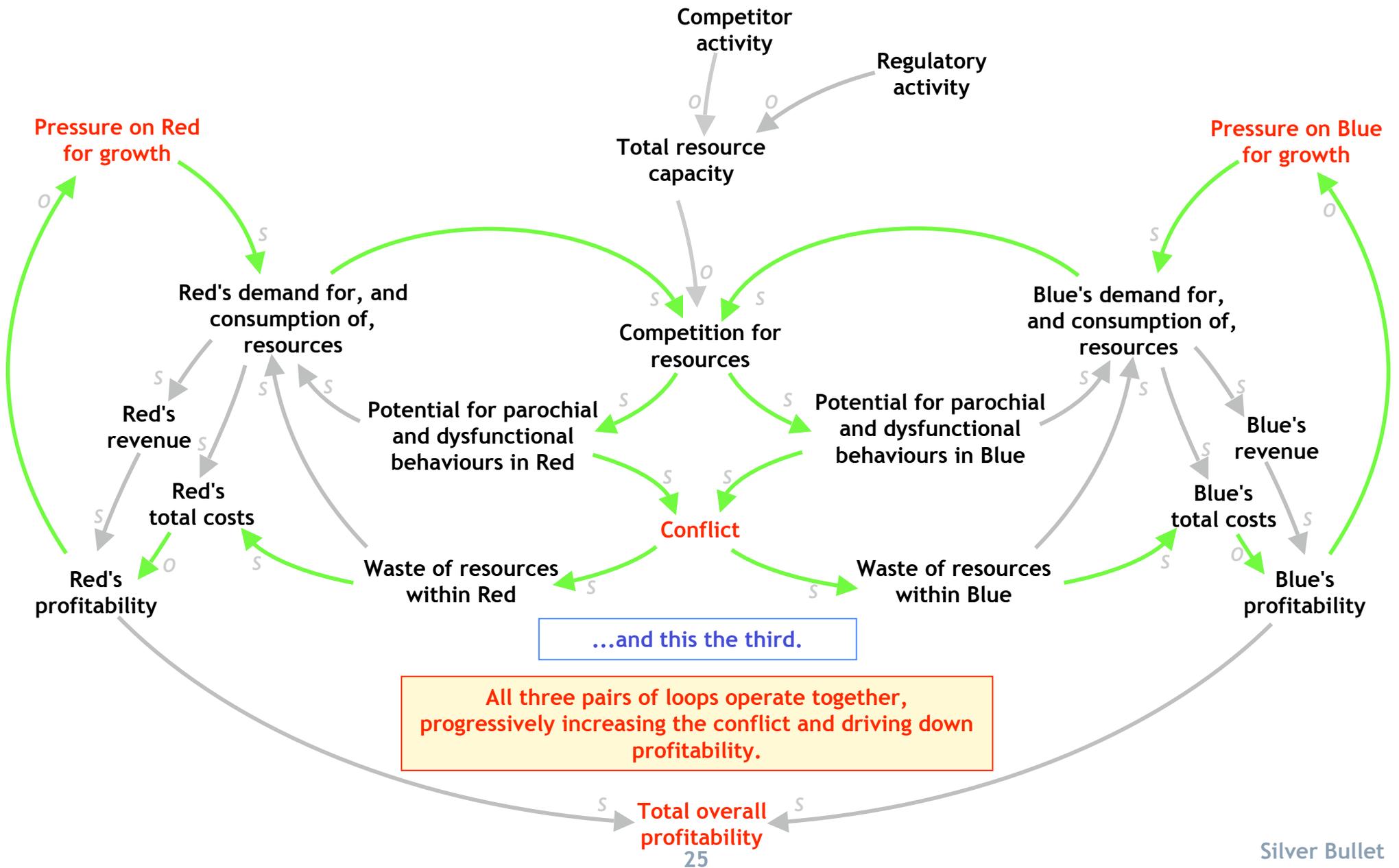


This is a very damaging lose-lose game, in which both businesses progressively damage their own, and each other's, profitability - and of course the total overall profitability.

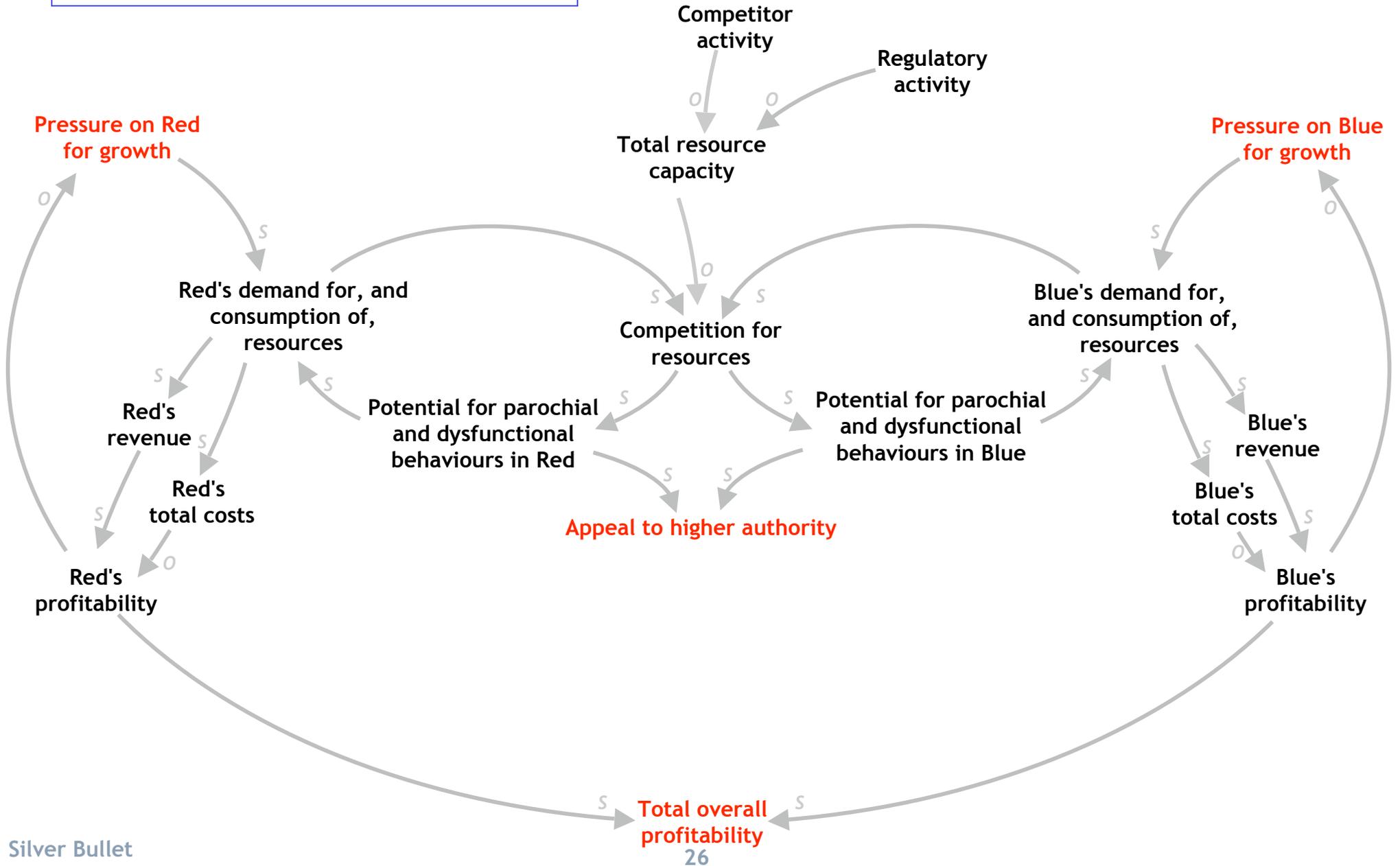


From a systems thinking perspective, this diagram is formed primarily from three symmetrical pairs of reinforcing loops, of which this is one...

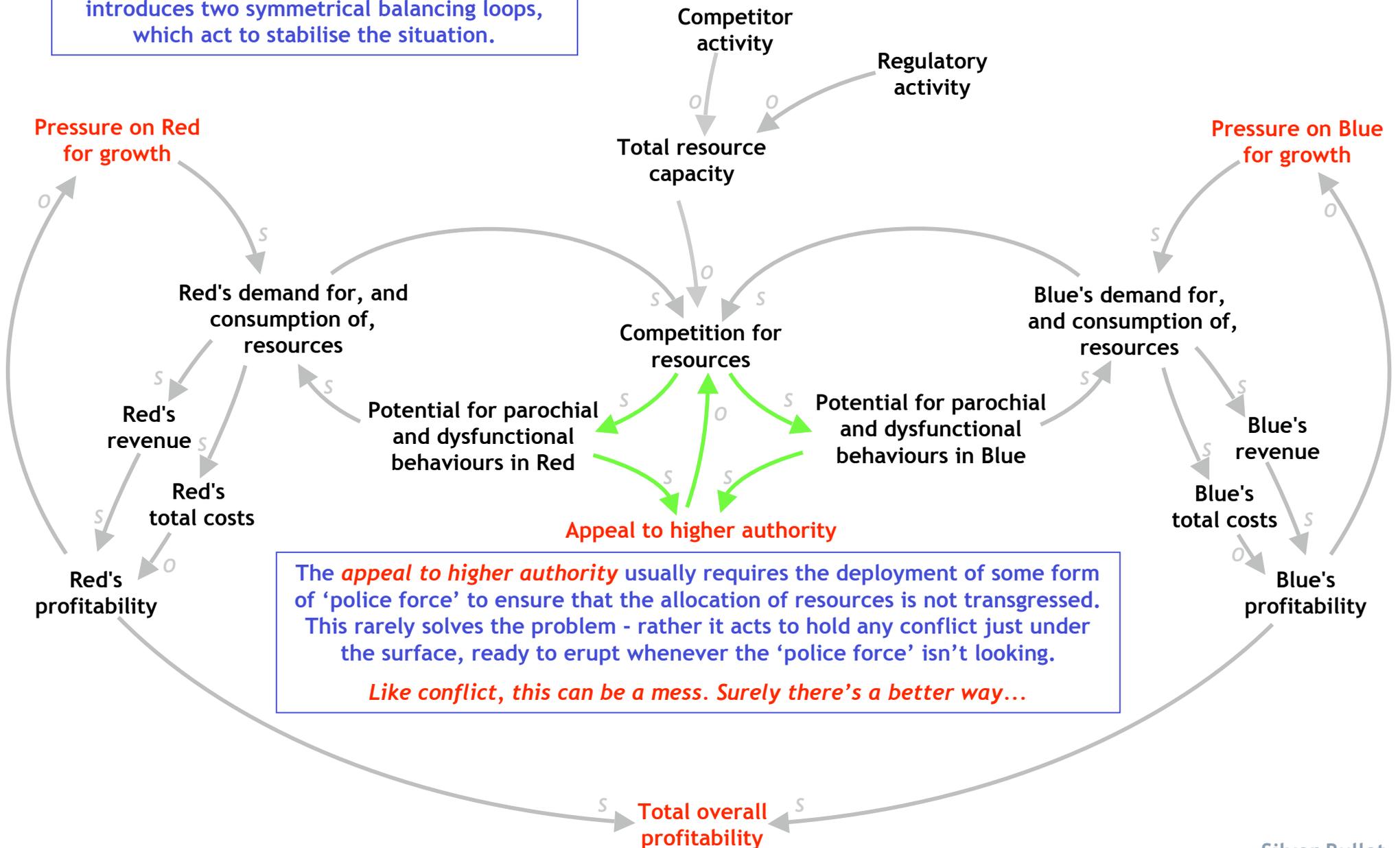




An alternative to *conflict* is an *appeal to higher authority...*



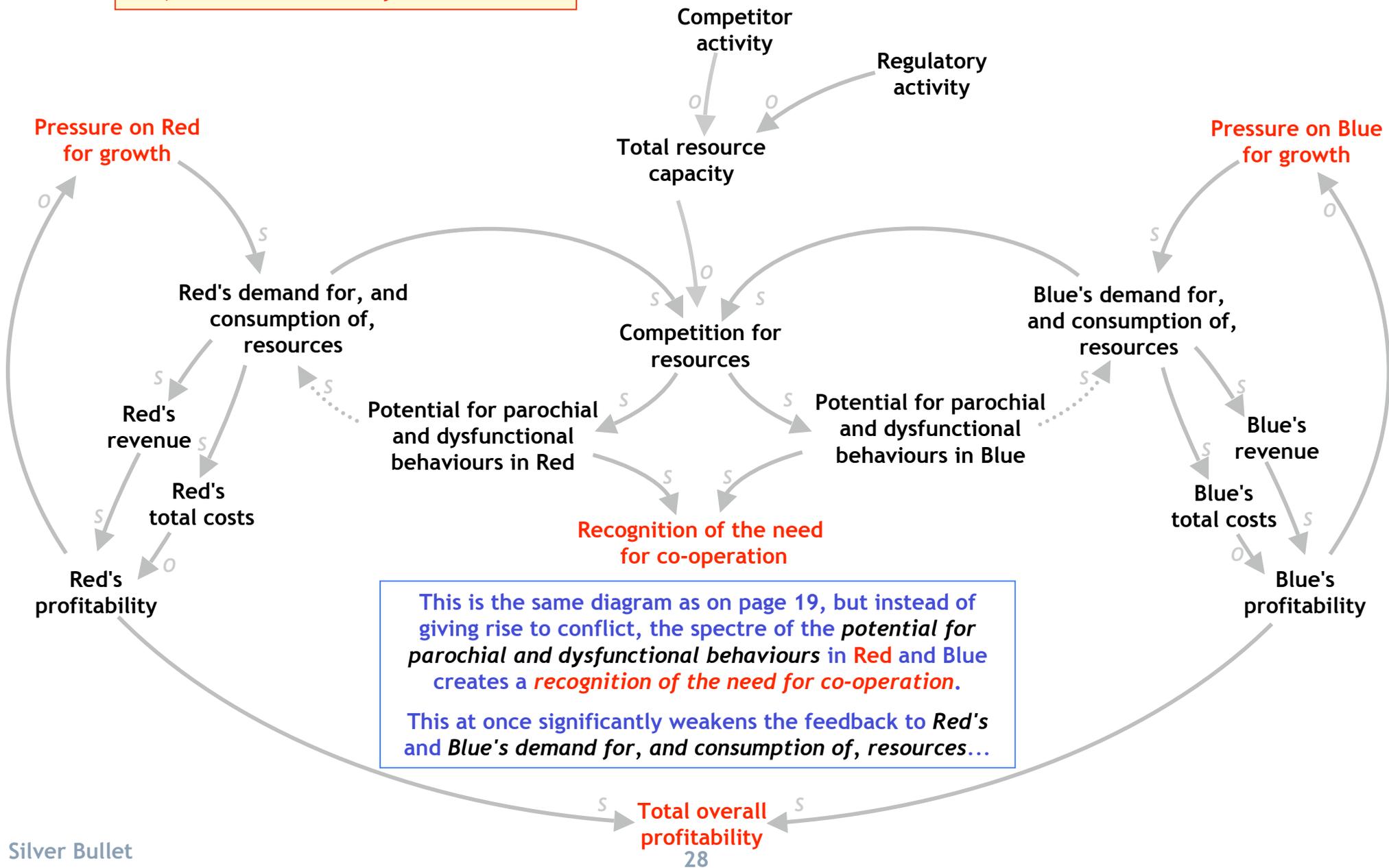
...the purpose of which is to arbitrate on the *competition for resources* by allocating the scarce resource between **Red** and **Blue**. This introduces two symmetrical balancing loops, which act to stabilise the situation.



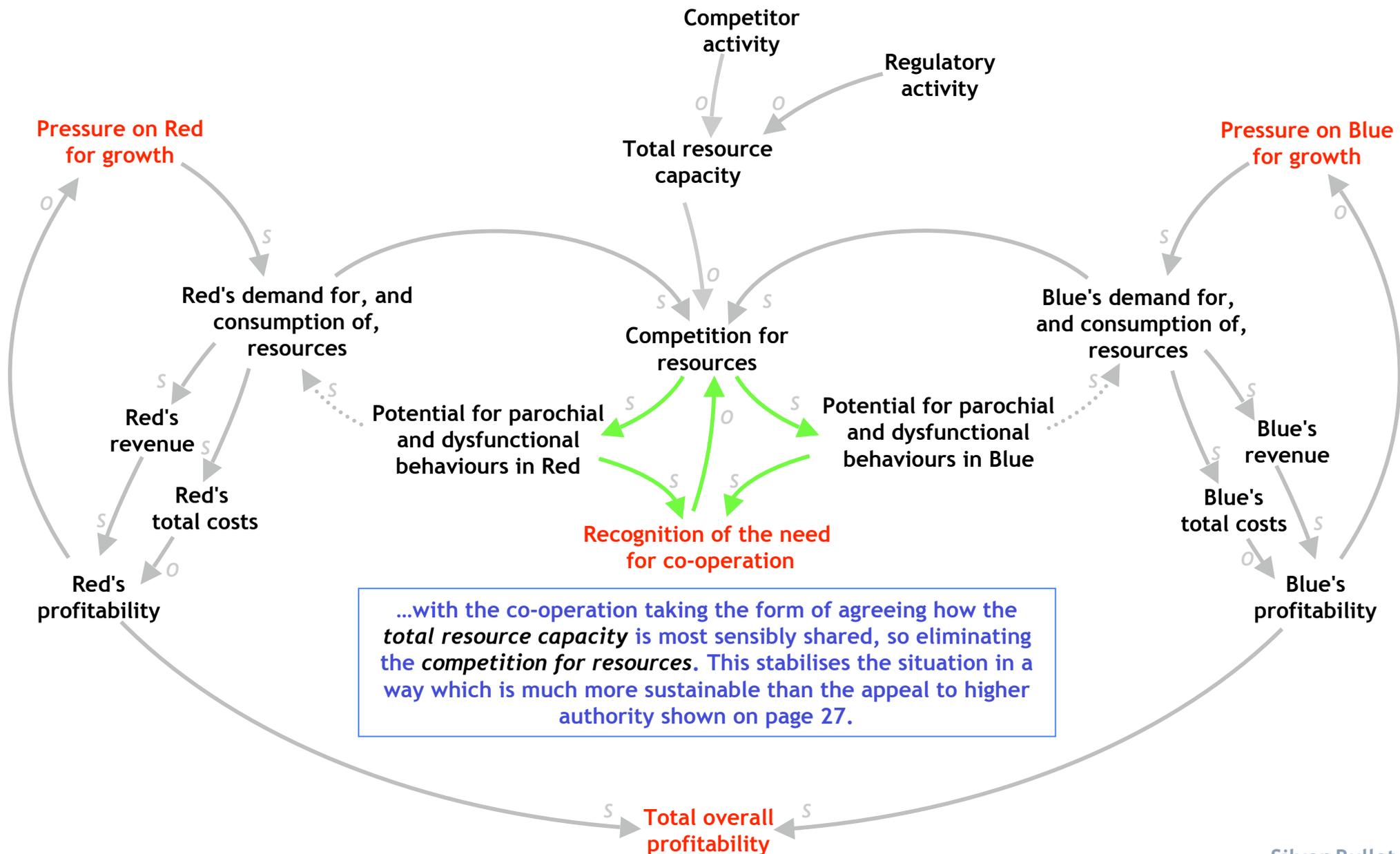
The *appeal to higher authority* usually requires the deployment of some form of 'police force' to ensure that the allocation of resources is not transgressed. This rarely solves the problem - rather it acts to hold any conflict just under the surface, ready to erupt whenever the 'police force' isn't looking.

Like conflict, this can be a mess. Surely there's a better way...

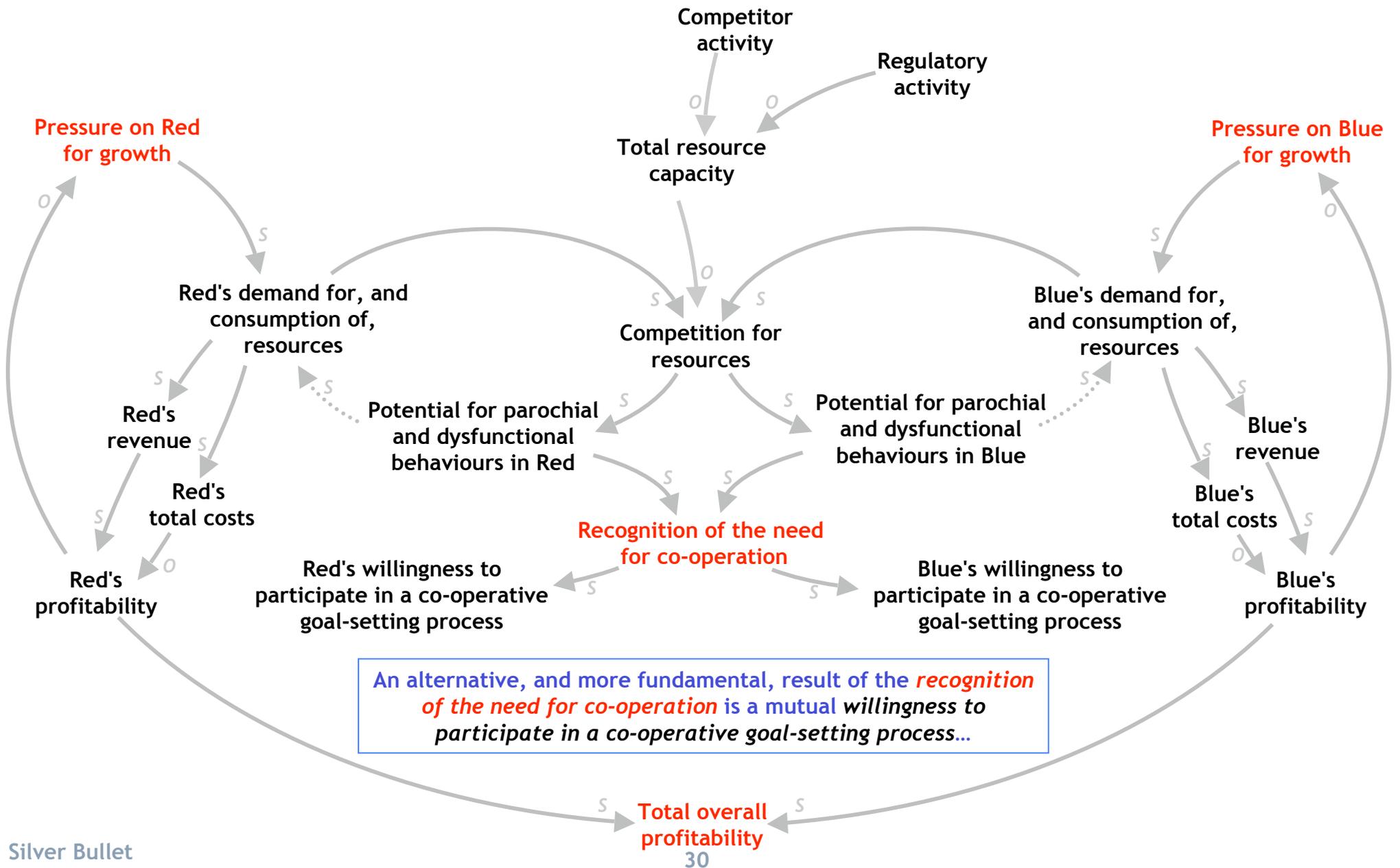
Yes, there is a better way...and here it is.

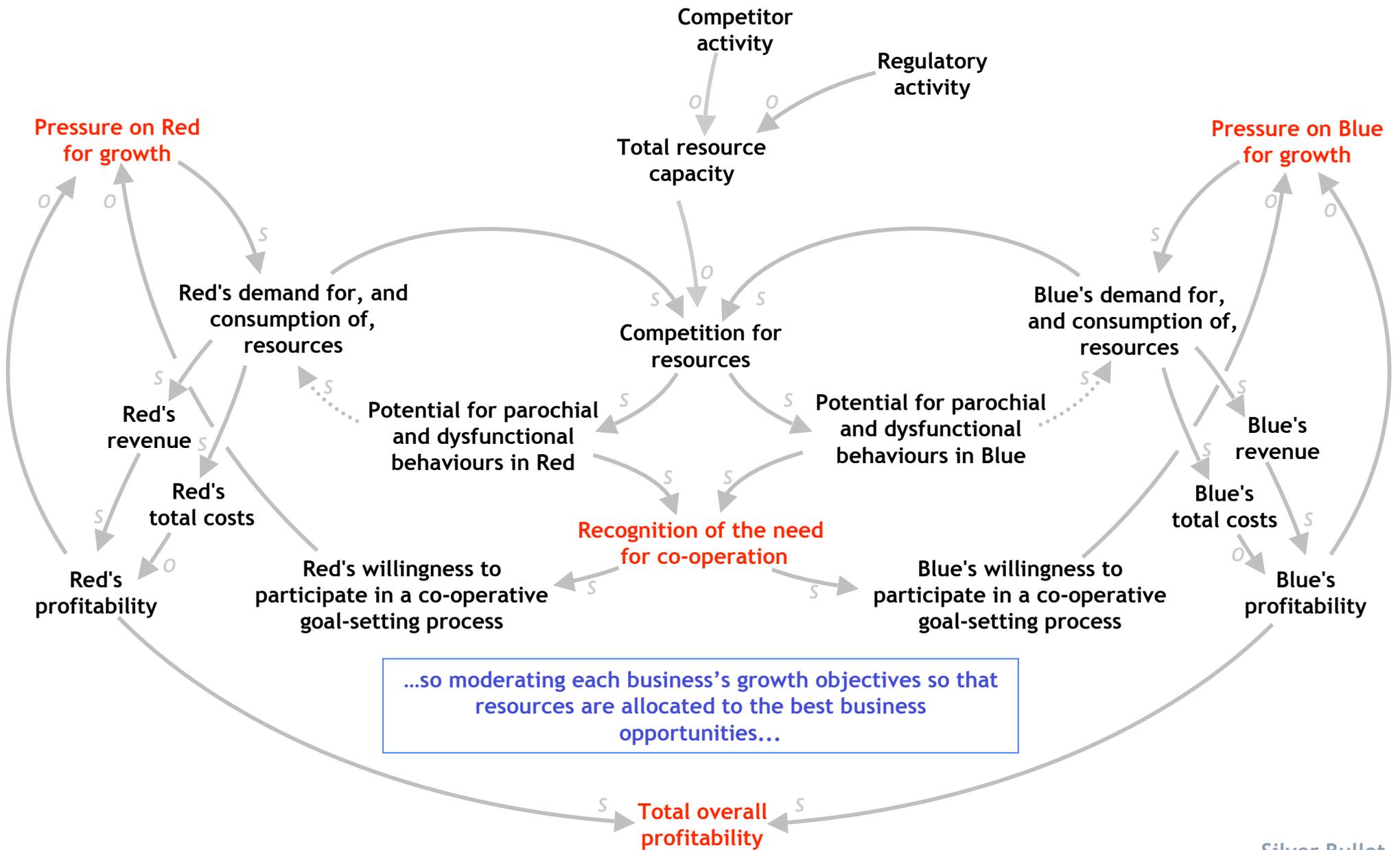


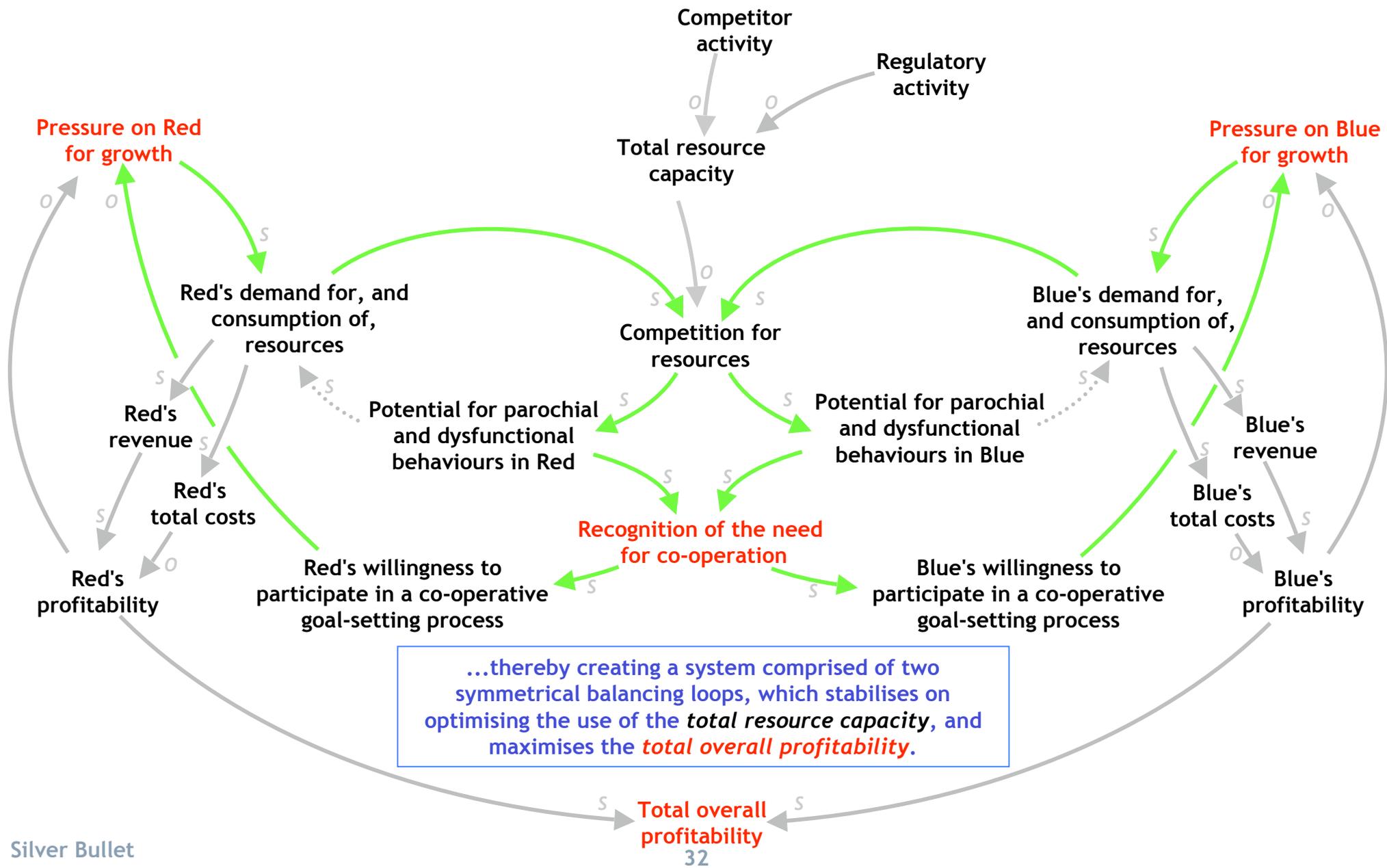
This is the same diagram as on page 19, but instead of giving rise to conflict, the spectre of the *potential for parochial and dysfunctional behaviours* in Red and Blue creates a *recognition of the need for co-operation*.
 This at once significantly weakens the feedback to Red's and Blue's demand for, and consumption of, resources...

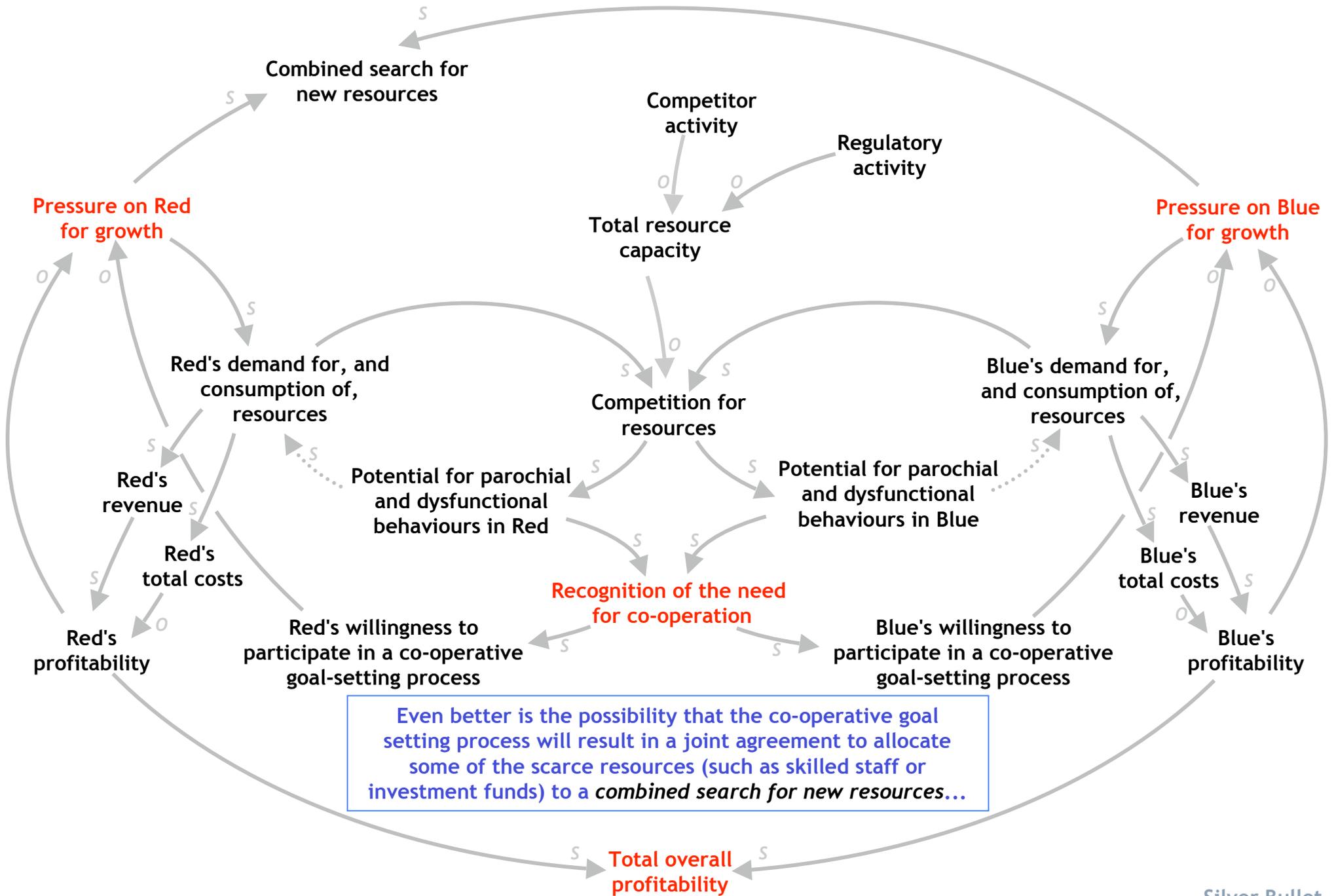


...with the co-operation taking the form of agreeing how the *total resource capacity* is most sensibly shared, so eliminating the *competition for resources*. This stabilises the situation in a way which is much more sustainable than the appeal to higher authority shown on page 27.

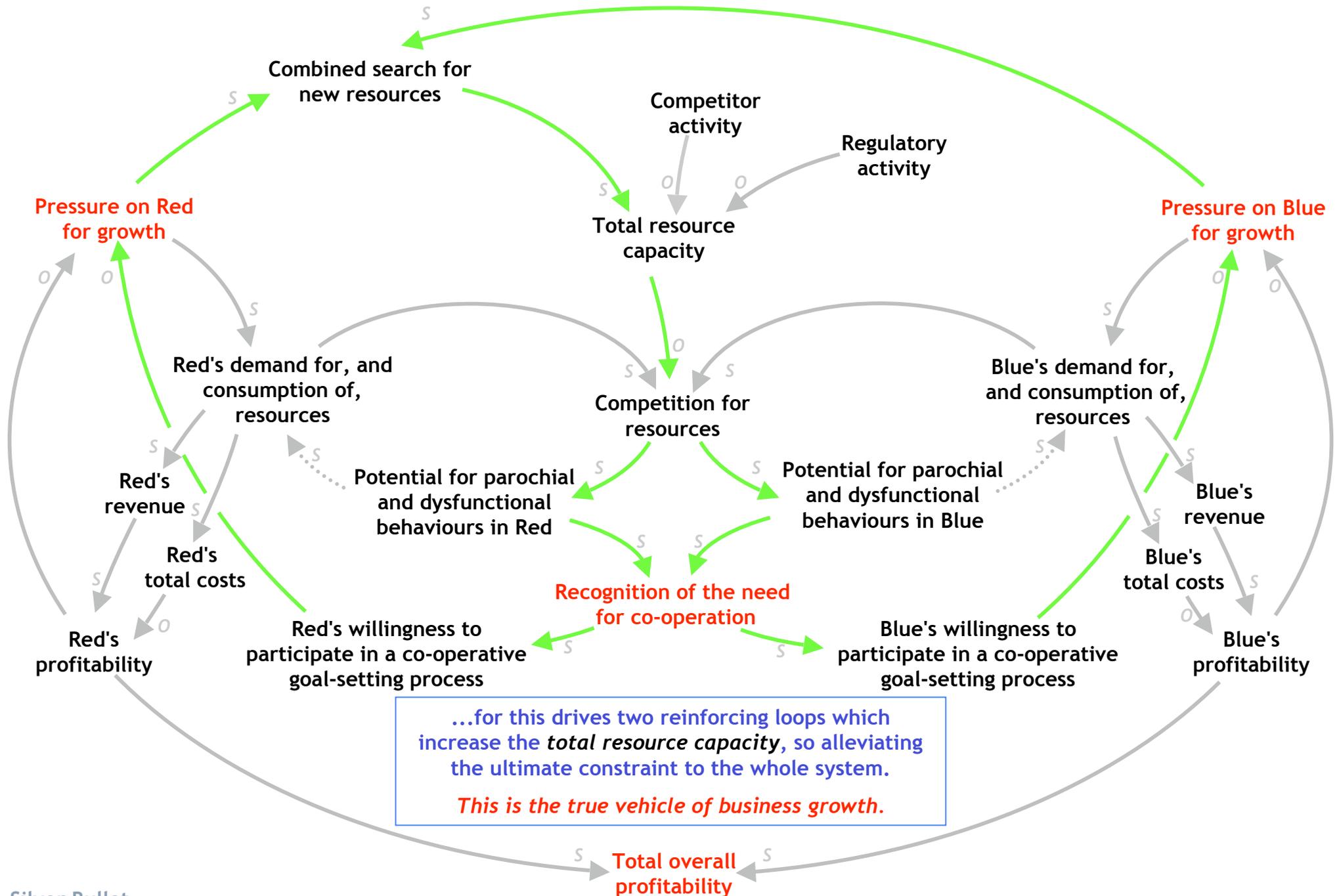




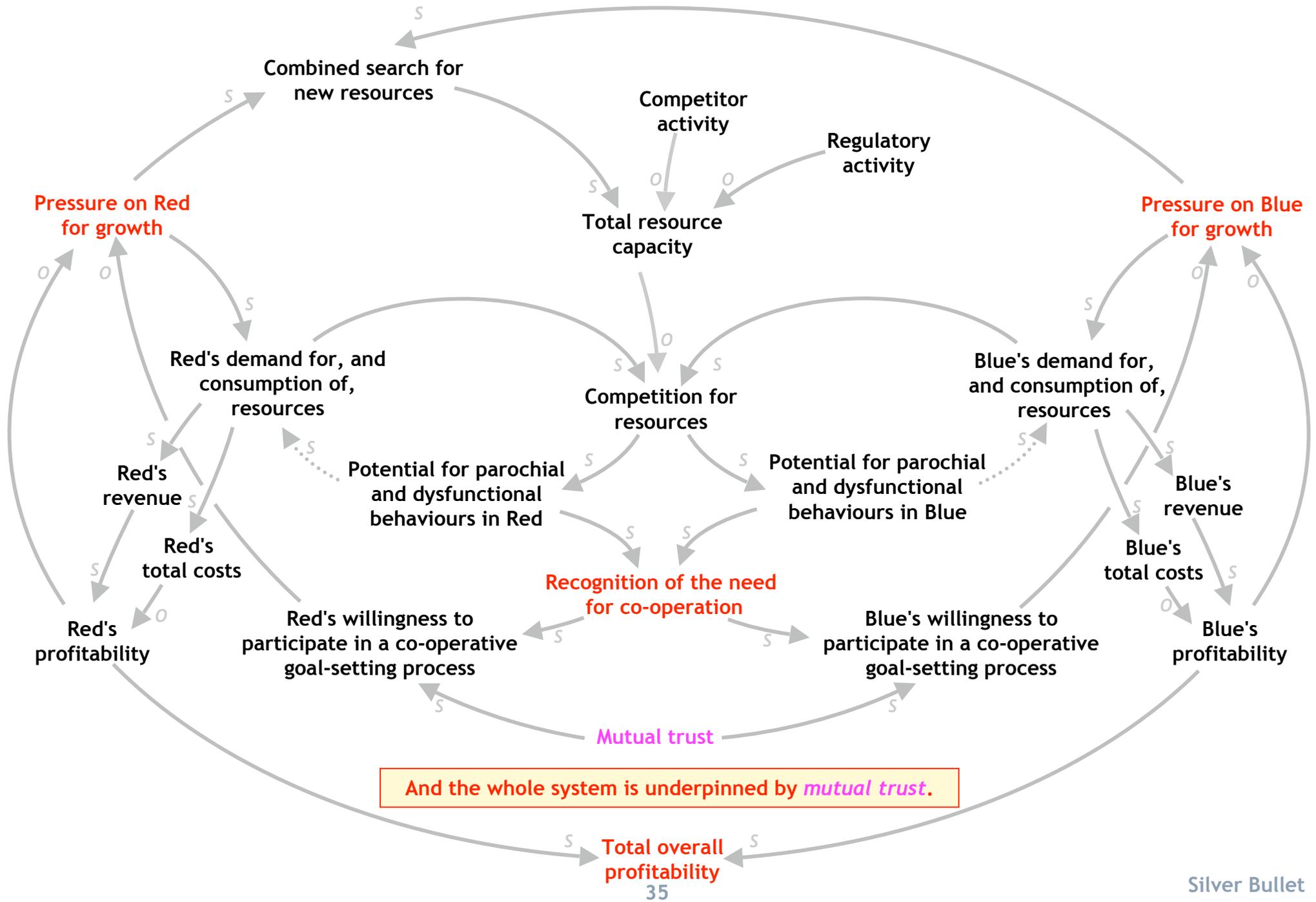




Even better is the possibility that the co-operative goal setting process will result in a joint agreement to allocate some of the scarce resources (such as skilled staff or investment funds) to a *combined search for new resources*...



...for this drives two reinforcing loops which increase the *total resource capacity*, so alleviating the ultimate constraint to the whole system.
This is the true vehicle of business growth.



And the whole system is underpinned by mutual trust.

***Isn't that
precisely what
'teamwork'
is all about?***

Idea generation,
evaluation and
development

Making innovation
happen

Silver Bullet

Strategy development
and scenario planning

The Silver Bullet Machine Manufacturing Company Limited

Building ultimate competitive advantage

Building
high-performing
teams

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