

Division of labour

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An in-depth look at the relationships between the division of labour and innovation:

We stress the plural, relationships, because the relationship is bi-directional.

1. the division of labour is one of the determinants of invention.
2. innovation in turn leads to a division of labour.

ADAM SMITH ON THE DIVISION OF LABOUR

Adam Smith in the 'Wealth of Nations' was probably the first to put the division of labour at the centre of a discussion of economic growth.

The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is anywhere directed, or applied, seem to have been the effects of the division of labour ...

➤ *The example of the pin-maker;*

In short, the division of labour plays an absolutely central role in the growth of productivity and hence in wealth creation.

ADAM SMITH ON INVENTION

One of the important consequences of the division of labour, as Smith saw it, was that it gave rise to invention and innovation.

For Smith, the key thing is that invention stems from a prior division of labour. That is, the direction of causation runs from the division of labour to the invention.

- *The invention of all those machines by which labour is so much facilitated and abridged, seems to have been originally owing to the division of labour. Men are much more likely to discover easier and readier methods of attaining any object, when the whole attention of their minds is directed towards that single object, than when it is dissipated among a great variety of things.*

Smith sees the direction of causation here from division of labour to invention and innovation.

Specialised labour builds up enough experience through learning by doing from which to create inventions as a problem-solving exercise.

Thus the process of the division of labour creates an incentive for specialised labour to seek to modify their tools and invent new ones.

JOHN RAE: THE REVERSE DIRECTION OF CAUSATION

According to Smith, invention was an important consequence of the division of labour, but it is the latter that lies at the heart of economic growth and wealth creation.

John Rae (1834) was perhaps the first economist to put invention at the heart of economic growth. And for Rae, the direction of causation was from invention to the division of labour, and not vice versa. Referring to Smith's 'Wealth of Nations', he put his alternative perspective as follows:

- *In the Wealth of Nations, the division of labour is considered the great generator of invention and improvement, and so of the accumulation of capital. In the view I have given it is represented as proceeding from the antecedent progress of invention.*

Rae doubted that the division of labour could give rise to invention.

But why did he think that the direction of causation should run from invention to the division of labour?

JOHN RAE: THE REVERSE DIRECTION OF CAUSATION

His explanation centres around economies of scale and specialisation:

- *Suppose an invention creates a new piece of capital equipment, which can offer a substantial productivity gain.*
- *But suppose this piece of capital is expensive and it is only really economically viable for a firm to buy one if it is in regular use.*
- *Rae then compares two forms of industrial structure:*
 - *one in which each workman does a little of each activity, so there is **no division of labour** → it will not be viable for each (or indeed for any) workman to buy his own piece of equipment so the invention will be unused*
 - *the other in which each workman specialises in a particular operation, so **there is a well developed division of labour** → it will be viable for the one specialist workman to buy the equipment and put it to constant use. In that second case, the capital equipment can be produced and used with consequent gains in productivity and wealth creation.*
- So Rae's argument is in effect that productivity-enhancing inventions will only be adopted and used if a specialist workman puts the invention to constant use. And as these productivity-enhancing inventions can be wealth creating, then an entrepreneur will see the profit opportunity to be made from a division of labour.

Who is right? Smith or Rae?

We can argue that both of them can be right.

Instead of demanding that one is right and the other wrong, we should recognise that there is something in both arguments.

If we look at the development of invention, there is a role for the division of labour in creating such invention. This is very evident in the history of academic invention, if I may call it that. Equally if we look at this history of labour specialisation, we shall see investment in certain expensive machinery (or human capital) is only viable if it can be put to constant professional use.

Indeed, this idea is very similar to Smith's idea that the division of labour is limited by the extent of the market.

So, perhaps the Rae view is not incompatible with Smith, even if the Smith view is contradicted by Rae.

This is not, however, the same as saying that Smith was wrong and Rae was right.

THE BABBAGE PRINCIPLE

Babbage is best known as one of the pioneers of computing, having invented some of the first calculating machines.

In his quest to raise money to develop his invention, he visited many manufacturers in order to get a better understanding of their processes and in the hope that they might provide financial support for his invention. Unfortunately for him, they did not. But fortunately for economics, a by-product of these visits was a very remarkable book on industrial economics.

In that, he articulated what is now known as the 'Babbage Principle':

➤ *the master manufacturer, by dividing the work to be executed into different processes, each requiring different degrees of skill or of force, can purchase exactly that precise quantity of both which is necessary for each process; whereas, if the whole work were executed by one workman, that person must possess sufficient skill to perform the most difficult, and sufficient strength to execute the most laborious, of the operations into which the art is divided.*

Babbage asks us to suppose a particular production process involves two tasks:

- one requires great skill but little strength, while the other requires great strength but no skill.
- Without any division of labour, it is necessary to find a worker who has both skill and strength. But with a division of labour, the strong worker can do the task requiring strength while the skilled worker can do the task requiring skill.

DIVISION OF LABOUR IN PC MANUFACTURE

The computer industry provides a very powerful example of the international division of labour at work.

Consider the table which lists the origins of the various components of a computer system sold in the UK.

It is almost meaningless to ask in what country a PC is manufactured.

In this table may understate the extent of the international division of labour.

Component	Origin
Brand	USA
Assembly of main box	Ireland
Chips on motherboard	USA, Korea, Taiwan, Philippines
Battery	Philippines
CD-ROM drive	China
CD-R (consumables)	Germany
Hard disk drive	Singapore
3.5" disk drive	Philippines
Modem card	Netherlands
Graphics card	China
Specialist video card	USA
Monitor	UK
Keyboard	Mexico
Mouse	Mexico
Child's mouse	Taiwan
Loudspeakers	Malaysia
Microphone	Mexico
Inkjet printer	Spain
Laser printer	China
Zip drive	Malaysia
Scanner	Taiwan
Webcam	China
Power supplies	Taiwan, China, Malaysia, Mexico
Manuals	Scotland, Ireland, Wales, Germany
Network switch	China

DIVISION OF LABOUR IN PC MANUFACTURE

In the early history of the PC market, most of the division of labour was within Silicon Valley.

Transaction costs are lower within a cluster and this means that outsourcing to specialist suppliers in the same cluster would be economically efficient while outsourcing to specialist suppliers in other countries would not.

Why should transaction costs be lower within clusters?

It is helpful at this stage to remind ourselves of some of the main facets of transaction cost.

While it might make sense for companies to outsource production of some input if an outside specialist could produce it better or cheaper, these companies may not do this if transaction costs are large.

DIVISION OF LABOUR IN PC MANUFACTURE

Amongst the transaction costs that may be important are the following:

- a. complexity of coordinating inputs with company requirements;
- b. costs of communicating with outside companies;
- c. risk of opportunistic behaviour by sub-contractors.

It seems likely that each of these can be reduced within a cluster.

If the input required is complex and it is difficult to ensure that inputs are compatible with the company's requirements, then the outsourcing company will need a lot of face-to-face contact with the sub-contractor. This is much easier and cheaper in a cluster, because the outsourcing company and its sub-contractor are physically close to each other.

More generally, if it is difficult to communicate requirements with sub-contractors, then it helps to build up familiarity with the sub-contractor. Communication between those who know each other well is generally more effective than those who do not. It is easier to form lasting business relationships in a cluster.

DIVISION OF LABOUR IN PC MANUFACTURE

Nowdays we observe a highly international division of labour.

The internationalisation has been driven by a very high degree of standardisation in the industry. The existence of these standards reduces transaction costs over distance. It does this because the ability to specify a standard in a contract reduces the risk from coordination problems – one of the key reasons for transaction costs.

This, coupled with the decline in costs of transport and communication, has lead to the outsourcing of ever more component production and assembly to lower wage regions and economies.

In a global market, any one company tends to specialise in the production of a small number of components to maximise economies of scale. We observe a lot of intra-industry trade between different clusters – and a lot of long-distance transport and communications!

Once again, we find that Adam Smith anticipated such developments. As noted before, Smith argued that, ‘the division of labour is limited by the extent of the market’.

THE DAMAGING EFFECTS OF DIVISION OF LABOUR

We conclude with a rather different perspective on the division of labour.

Some critics were dubious on the fact that the division of labour is a powerful force for economic efficiency and growth.

The division of labour might increase the productivity of labour...

but at what cost in terms of the loss of human dignity?

THE DAMAGING EFFECTS OF DIVISION OF LABOUR

Ruskin was not the first to criticise the division of labour. Also, Adam Smith had some harsh words to say on the subject

- *The man whose whole life is spent in performing a few simple operations, of which the effects are perhaps always the same, or very nearly the same, has no occasion to exert his understanding or to exercise his invention in finding out expedients for removing difficulties which never occur. He naturally loses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become...*

THE DAMAGING EFFECTS OF DIVISION OF LABOUR

Later, political economists and neoclassical economists were also clear about this. Jevons (1878, pp. 41-42) recognised that:

- *There are certainly some evils which arise out of the great division of labour now existing in civilised countries ...*
- *In the first place, division of labour tends to make a man's power narrow and restricted; he does one kind of work so constantly, that he has no time to learn and practise other kinds of work. A man becomes, as it has been said, worth only the tenth part of a pin; that is, there are men who know only how to make, for instance, the head of a pin.*

THE DAMAGING EFFECTS OF DIVISION OF LABOUR

The sociologist Durkheim, argued that these damaging effects would apply equally to a mathematician spending too much time working on a very narrow type of equation, as to a pin-maker making one tenth of a pin:

➤ *If we have often rightly deplored on the material plane the fact of the worker exclusively occupied throughout his life in making knife handles or pinheads, a healthy philosophy must not, all in all, cause us to regret any the less on the intellectual plane the exclusive and continual use of the brain to resolve a few equations or classify a few insects: the moral effect, in both cases, is unfortunately very similar.*

In view of that, we can now understand why Rae argued that the direction of causation ran from invention to the division of labour – and not, as Smith said, from division of labour. For if the division of labour is so damaging to the intellect, how can divided labour sustain any creativity or invention?