Appendix: The Age of Machinery

29th September 2016
Technological progress and change

Technological progress in a historical perspective

- The previous lecture suggests that technical advancement translating innovations into productivity growth is a necessary condition for development.
- Technological progress and the consequent increase in productivity were achieved through the progressive application of tools, instruments and, more generally, means of production to assist human labour.
- Improved methods of agricultural production were invariably achieved by the application of new tools: a most notable example is the iron plough, the windmill, the watermill and other, either simple or complex, instruments.
- More generally, technical progress has historically implied the deepening of the physical capital structure of the aggregate production process.
- It is important to remark that this process owes much to division of labour that has, in turn, fostered specialisation.
An useful reference is the work by economic historian David Landes. In his book ‘The Unbound Prometheus’ he significantly states the crucial characteristics of an industrial revolution:

- Substitution of mechanical devices for human skills.
- Substitution of inanimate power, e.g. steam, for human and animal strength.
- Improvement in getting and using raw materials.
- A deep change in the organization of human labour: the factory system.
Conditions

- Technical change, even in its simplest form, requires a change in the knowledge base of the economy concerned.
- The social context must generate the urge to acquire new knowledge, to explore new cognitive domains, to break the constraints that tie thought-processes to set ways.
- New knowledge, although a prerequisite, is not sufficient to generate technological advancement: what is required is the mental attitude and the entrepreneurial capability to turn new notions into applied techniques.
Some historical background: an endogenous process

- As mentioned in the introduction, instances of growth, in some cases rapid growth, have indeed been recorded several times but in all cases retrenchment followed expansion.
- The British industrial revolution was possibly the first case of an economic take-off which became self-sustaining: upswings did not turn into definitive downswings.
- One characteristic stands out: the industrial revolution was not merely sustained economic growth but growth occurring because of economic and social transformation.
- Turning our attention to the British industrial revolution is of great relevance since, being the first, it cannot be explained by outside, exogenous, determinants: no external financial markets, no technological transfer from already more advanced economies, no sources of demand from faster growing countries. It clearly was an endogenous process.
- Britain had to pull itself up with 'its own bootstraps'.
Some historical background: a legitimate question

- What were the causes of British growth and why it didn’t it fizzle out? These are crucial and related questions.
- We can rule out the 'historical accident' view: it wasn’t a random event.
- Not the 'climate', the 'geography' or 'natural resources', although on a very long-term sense these may be considered important elements that were common to many other countries.
- 'The scientific revolution', the specific culture engendered by the 'Protestant Reformation': relevant cultural factors but surely not unique to the specific case in hand.
In the 18th century, Great Britain had no major working population tied to the land by pre-capitalist forms of bondage.

A resilient national market (England) was in already in place.

The necessary technology to fuel a take-off was already present: in any case it did not require huge investments to be implemented: it was 'cheap and simple'.

There was a social class, a bourgeois class, willing to invest: no shortage of 'capital'.

Important infrastructure was already there: canals, waterways, roads, ports.

All these crucial factors were the outcome of previous policies ushered in the wake of the Cromwellian reform.
The initial thrust: the effective demand problem

- While some of the necessary conditions were indeed there, the question arises of what caused a sustained output growth: what was that warranted investment in new plant, commercial undertakings, factories?
- Population growth and the growth of the domestic market
- The export market and trade.
- Note that the former would imply a fully endogenous growth process, the latter a growth process fueled by and outside source: export-led growth
International trade as the initial most powerful growth force

- Export industries were much more dynamic: between 1700 and 1750 they grew by 76% and by 80% between 1750 and 1770.
- In contrast, industries tied to the domestic market grew, in the same periods, by 7%.
- But export industries fluctuated much more wildly.
Building up the British success

- A long-drawn process: from Elizabethan polices to Cromwell: Britain had its revolution.
- Conquering the high seas: the British Navy and the long distance trade.
- The colonies and the raw materials for infant industries: supplies for a 'mass' market not for luxury consumption.
- Producing raw materials for a growing industrial market: the colonies’ role in the growth process: a centre-periphery model
- The slave trade.
Readings