DST Analyse
7 June 2019
2019:8

Production abroad has an effect on Danish GDP

By Dan Knudsen

Globalisation has created new business models. Although you can still find traditional manufacturing enterprises with factory production, development, sales and administration gathered within the Danish borders, it has become more common to spread across several countries. An increasing share of the Danish manufacturing enterprises produce their goods or some of their goods without factories in Denmark. In this way, the industrial processing does not take place in Denmark but in a factory abroad.

Part of the value added from the processing in factories abroad is included in the Danish gross domestic product (GDP) because the factors of production of Danish enterprises – not least the intellectual capital – contribute to create the value of the foreign factories' production. The intellectual capital of enterprises is based on research and development, and it is the basis for patents and other intellectual property rights that can be registered and traded. Tangible assets such as machinery and buildings are capital in the country in which they are located. Intangible assets are capital in the country in which their economic owner is registered. In this way, intangible assets are similar to aircraft or vessels, neither of which are geographically confined, but are included in the capital stock of the country in which the airline or shipping firm is registered. In this analysis, we discuss how using a foreign factory affects Danish production and value added.

Main conclusions:

- The production abroad of Danish manufacturing enterprises has grown considerably since it was first recorded in 2005. The increased production abroad of Danish enterprises has resulted in increased hourly productivity in manufacturing and reduced the employee compensation share of the value added in manufacturing.
- Gradually, the "factoryless" goods production of the manufacturing industry accounts for a higher share of Danish GDP than maritime transport. Factoryless production and maritime transport are characterised by their relatively small impact on Danish employment and a considerable Danish registered capital stock.
- Moving intangible capital and associated added value from one country to another can make GDP jump, as the Irish GDP did in 2015. This type of jump in GDP does not influence gross national income (GNI) to the same extent, if the owner remains foreign. Because, in the calculation of GNI, the net yield of intangible capital is transferred as factor earnings to the owner's home country.

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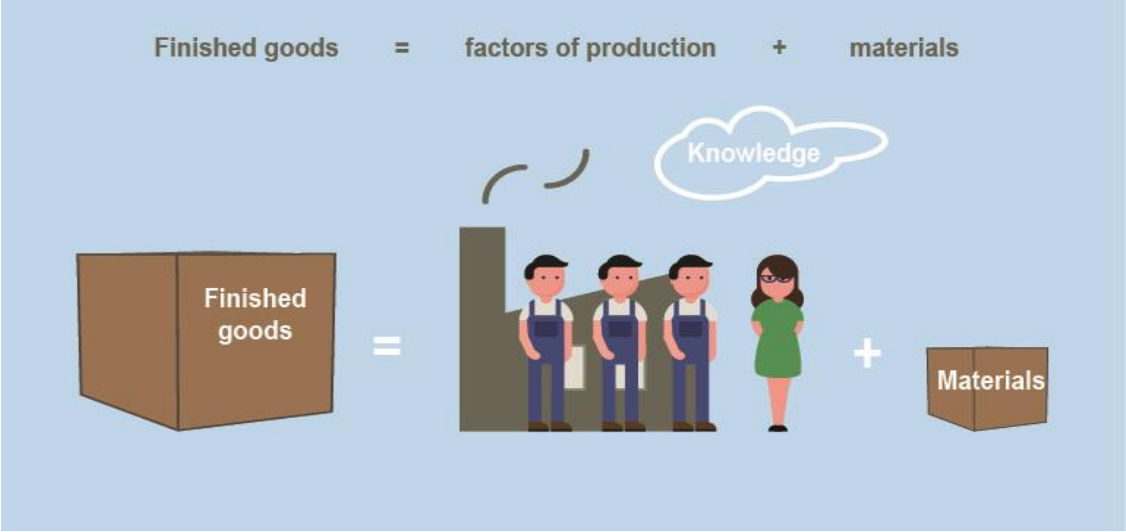
What is factoryless goods production?

A traditional manufacturing enterprise that depends on exports has a factory as well as development, sales, purchasing and organisational departments etc. in Denmark. Figure 1 illustrates the factors of production of the enterprise with the finished goods ready for export to the left and the input of materials to the right. In this example, the enterprise imports the materials, so the enterprise only trades abroad.

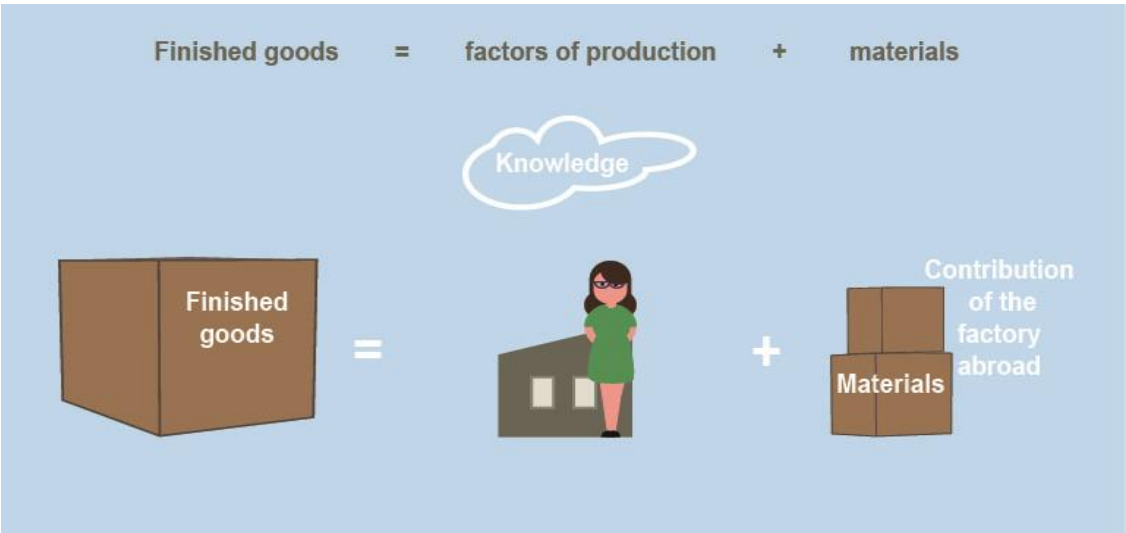
As mentioned, this is a traditional manufacturing enterprise, meaning that the factors of production include a factory with machinery and office space. In addition to this, the enterprise has intellectual capital (symbolised by a cloud of knowledge in figures 1 and 2), skilled and unskilled factory workers as well as developers, sales staff, organisational staff etc. The three men wearing overalls in figure 1 are factory workers, whereas the woman represents developers, sales staff, organisational staff etc.

Figure 1 **Danish enterprise before relocation of factory**



Assume that the enterprise moves its factory production to a location abroad. The enterprise may own the factory abroad, but the factors of production in Denmark have declined, as shown in figure 2. The remaining factors of production include the intangible capital, the developers, sales staff and organisational staff as well as an office building. However, the factory workers and the factory are gone, and factory workers in a factory abroad have replaced them. The processing in the factory abroad adds value to the materials. The value added constitutes the production contribution of the factory abroad, and this is illustrated in figure 2 by an additional box on top of the imported materials.

Figure 2 **Danish enterprise after relocating the factory abroad**



The Danish enterprise has outsourced the physical processing to an enterprise abroad, but it still owns the materials, finished goods and intangible capital and handles development and sales. Clearly, the Danish enterprise will still consider itself a goods producer, and it will indeed be categorised as a factoryless goods producer in the national accounts, i.e. together with the other manufacturing enterprises. The decisive criterion for factoryless goods production is here that the Danish enterprise still owns the materials.[1] If the enterprise gave up ownership of the materials, purchased the goods produced from the foreign factory and resold them at a profit, the activity would have become merchanting and, in that case, the enterprise would be included as a trading company in the national accounts. If relevant, see Statistics Denmark (2017) on merchanting.

Based on figure 2, the national accounts will continue to enter the goods produced as Danish exports, because the Danish enterprise owns the goods. The enterprise also owns the materials, so the materials including the value of the foreign factory's contribution are entered as Danish imports. The value added of the Danish enterprise is still equal to the exported goods production minus the imported intermediate consumption. The latter includes the contribution of the foreign factory to total value added on materials, and this contribution pays the foreign factors of production. The value added of the Danish enterprise goes towards paying the Danish factors of production.

It is important for the statistical recording that the sold goods and the purchased materials are included as Danish exports and imports respectively in the national accounts. Some people would perhaps remove sold goods and purchased materials from the Danish enterprise, because none of these items have crossed the Danish border. In this way, the Danish factors of production in figure 2 would not produce anything at all and provide zero value added. All production and value added would be included abroad. However, this method of accounting would not provide a fair presentation, as no one would keep factors of production that are unproductive.

With the approach of the national accounts, the price of the foreign processing service is applied.[2] The price of the service represents the contribution of the foreign enterprise to total value added on materials, and the contribution of the Danish enterprise to the value added is determined residually as production value minus intermediate consumption including the value added of the foreign enterprise. At the same time, the Danish enterprise continues to be goods producing, and its production as well as its value added is referred to as factoryless, because the enterprise produces goods without a Danish factory.

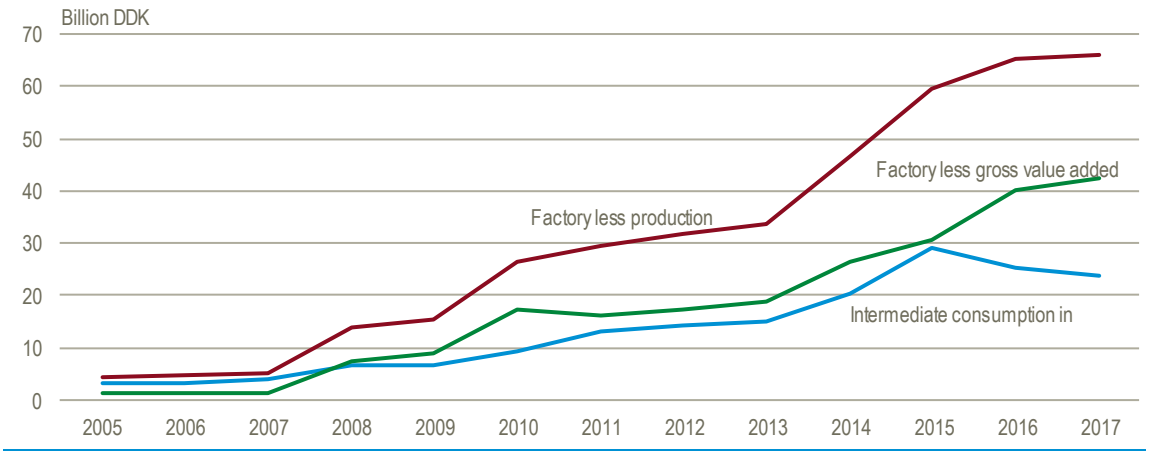
[1] Ownership of the raw materials is also decisive for the manufacturing industry's commodity statistics. If an enterprise owns the input of materials, it produces goods. If it does not own the materials, it is said to carry on trade or work under contract, and both of these activities are production of services.

[2] The Danish enterprise often owns the foreign enterprise and, if so, the Danish enterprise calculates a cost price for the use of the foreign factors of production.

Increasing factoryless goods production

The total factoryless goods production of Danish enterprises has grown considerably since it was first assessed in 2005. The development in the total Danish factoryless goods production and the associated gross value added as well as intermediate consumption are shown in figure 3. The content in the three time series shown is clarified in appendix 1.

Figure 3 Factoryless goods production, intermediate consumption and gross value added



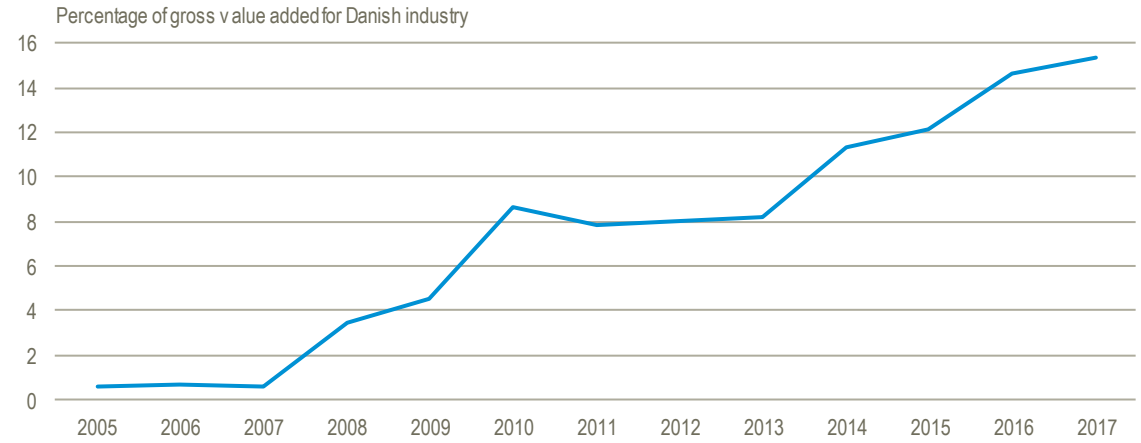
Source: statistikbanken.dk/bbuhv and statistikbanken.dk/uhtp and own calculation; see appendix 1. Intermediate consumption comprises materials and the processing service of the factory abroad.

The vast majority of the factoryless goods production is sold directly from the involved foreign factories to the foreign buyers and is thus represented as Danish goods exports not crossing the Danish border. The intermediate consumption in the factoryless production is similar to the intermediate consumption in the production in Danish factories, but intermediate consumption in factoryless production also includes the processing service of the foreign factory.

All of the factoryless value added can be attributed to the Danish factors of production, i.e. the Danish parent's developers, sales staff and organisational staff etc., office buildings and not least the intellectual capital, which is nearly always registered as belonging to the parent company.

Figure 4 further illustrates the increasing significance of factoryless production. The factoryless share of the manufacturing industry's gross value added has grown from less than 1 per cent in 2005 to around 15 per cent in 2017.

Figure 4 Factoryless gross value added as share of total manufacturing value added



Source: statistikbanken.dk/bbuhv and statistikbanken.dk/uhtp and own calculation; see appendix 1. Manufacturing is classified as C in the 10a3 grouping of the national accounts.

Box 1. Need for statistical documentation of factoryless production

Factoryless production deviates systematically from traditional industrial production. For example, fewer employees and no machinery is applied in Denmark in the factoryless production. Moreover, the exports provided by factoryless production depend only to a limited extent on Danish costs. This is why separate details are required about the Danish factoryless production, including a breakdown on price and production volume and connected exports. E.g., it is relevant to include such details in the ADAM model of the Danish economy.

In general, the manufacturing statistics should perhaps not just be broken down on industrial grouping, but also on business model. E.g. whether it is i) a traditional manufacturing enterprise that has a factory as well as development and sales and owns and assumes the risk of finished products and raw materials; or ii) a service producing manufacturing enterprise that produces added value for others in its factory without ownership of the goods and without responsibilities for development and sales; or iii) a factoryless manufacturing enterprise that only has development, sales and administration, but owns the goods and assumes the production risk.[3]

An enterprise under iii) has a service producing enterprise under ii) for handling the factory-based production. As opposed to Danish goods production, the service producing enterprises are often located abroad, so that production and value added spread across several countries, but there are also Danish enterprises that could be fully or partly classified under ii).

Factoryless goods production is comparable to earnings on aircraft and vessels

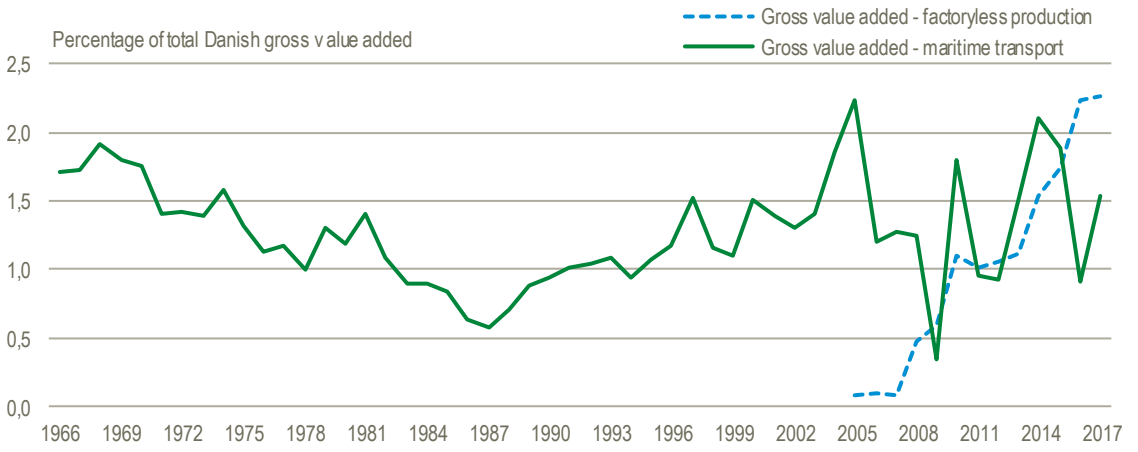
The intangible research and development capital was introduced with the transition to the new national accounts manual (ESA2010) in 2014. It is an important factor of production, which includes patents and other intellectual property rights owned by the enterprise, which impact the value of the production of the enterprise. As the name suggests, intangible capital is not physically present, and it is included in the capital stock of the country where its economic owner is registered. In this way, it is similar to aircraft or vessels, which are always included in the capital stock of the country where the airline or shipping firm is registered, regardless where on the globe they are flying or sailing.

Vessels as well as intangible capital can easily change country of registration, and the earnings of the vessel and the intangible capital change with it. E.g. earnings from shipping on distant oceans and expenditures in distant ports are only included in the exports and imports of the Danish national accounts if the shipping company enters it in the accounts of their Danish headquarters. If the business model of the Danish shipping company requires that the company does not integrate a foreign shipping company that they have acquired in their accounts, but simply posts the profits from the acquired company, the activity will not be included in Danish exports and imports and consequently not affect GDP. Maritime transport and factoryless manufacturing production are also similar in that they have limited effect on the employment in the owner country.

From this perspective, we compare the factoryless gross value added with the gross value added of the maritime transport in figure 5. The figure shows that, gradually, the factoryless goods production accounts for more of the total gross value added (GVA) than the maritime transport.

[3] The three business models are also used in the American classification system according to a recommendation from the Economic Classification Policy Committee ECPC, with the difference that ECPC recommends including enterprises without ownership of materials (merchanting enterprises) as goods producers in the factoryless category iii).

Figure 5 **Factoryless production and maritime transport as share of total gross value added**



Source: statistikbanken.dk/bbuhv and statistikbanken.dk/uhtp and own calculation; see appendix 1. Maritime transport is from ADAM's data bank.

The steep rise in the Danish factoryless gross value added does not reflect a strong inflow of foreign intangible capital. The rise originates from Danish enterprises that – based on their own intangible capital – have extended their production without the involvement of Danish factories. Maritime transport has been influenced by sudden inflows of foreign vessels, such as the Danish purchase of the American Sea-Land shipping company in December 1999. Exports of maritime transport also increased exceptionally in 2000, but the gross value added of maritime transport increased more moderately since fuel consumption etc. also increases when maritime transport increases.

To sum up, maritime transport and factoryless manufacturing account for growth contributions of the same magnitude. Maritime transport has contributed positively and negatively. The rising factoryless production has contributed positively to the growth, but even the largest contributions to gross value added and GDP from both of these activities have very little impact on Danish employment. It reflects that the associated Danish employment in the Danish headquarters is relatively small and does not vary proportionately with the activity.

Factoryless production affects productivity

As mentioned, the factoryless goods production accounts for 15 per cent of manufacturing gross value added in 2017. Without the factoryless value added, the hourly productivity would have increased at a correspondingly lower rate.

The effect of including the factoryless gross value added in the labour productivity of Danish manufacturing appears from figure 6, which shows the labour productivity both with and without factoryless gross value added. The labour productivity is an hourly productivity defined as gross value added at constant prices per hour worked, and it is assumed that the factoryless share of the gross value added at constant prices corresponds to the share at current prices.

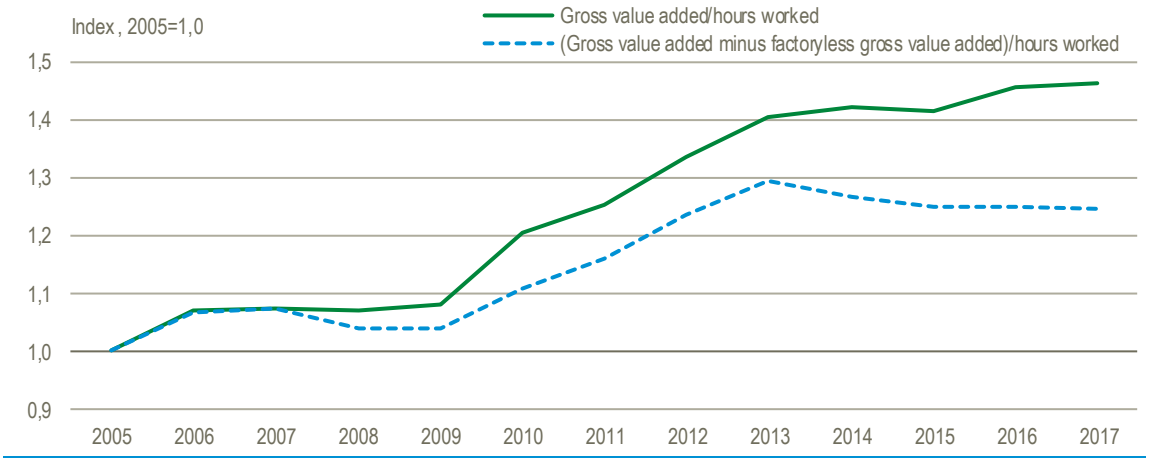
Figure 6 illustrates what the factoryless gross value added has meant to the development in labour productivity since 2005. In 2005, there was hardly any difference between the productivity with and without factoryless goods production. From 2005 to 2017, the hourly productivity grew just under 50 per cent inclusive of the factoryless gross value added and only 25 per cent exclusive of factoryless gross value added. The difference does not necessarily reflect the underlying globalisation effect on productivity. Because the total calculation includes both the fact that the globalisation may have reduced the traditional industrial production and the fact that the replaced Danish factory workers may have gained other employment.

It seems obvious, though, that the strong expansion of the factoryless production since 2005 must have increased the measured Danish productivity, since part of the expansion has consisted in increasing the existing production in factories abroad without closing Danish factories.

It is not possible to estimate the share of factoryless production in hours worked. Consequently, we cannot estimate separate labour productivities for factoryless production and traditionally organised manufacturing. It is, however, safe to assume that labour productivity is smaller in the traditionally organised manufacturing. This means that the solid line in figure 6 represents an upper limit on labour productivity in traditional manufacturing, i.e. excluding factoryless production. This upper limit assumes that the share of factoryless production in hours worked is as high as its share in value added. The dashed line is a lower limit on traditional productivity. This lower limit sets hours worked in factoryless production to zero.

In summary, the Danish headquarters controlling the factoryless production have a relatively high productivity, measured as gross value added per hour worked.

Figure 6 **Hourly productivity in manufacturing with and without factoryless gross value added. 2010 prices**



Source: statistikbanken.dk/bbuhv and statistikbanken.dk/uhtp and own calculation; see appendix 1.

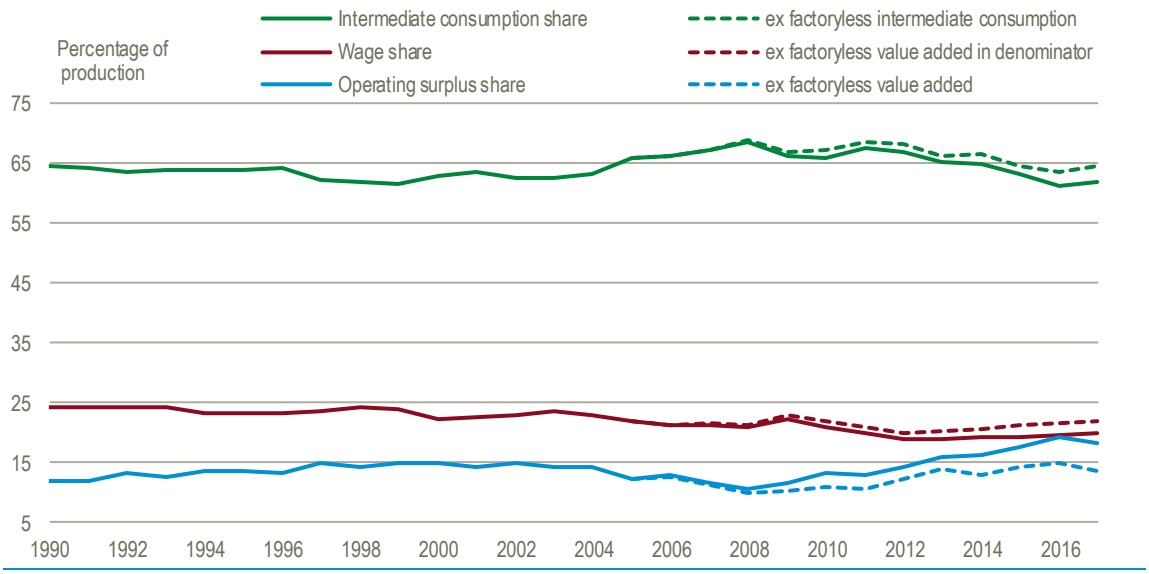
Factoryless production has contributed to reduce the wage share

In recent years, the operating surplus of the manufacturing industry has soared, and this is partly due to the increased globalisation. The operating surplus is part of the gross value added, which accrues to the capital stock and its owners. The escalation of the operating surplus has happened over the last 10 years, during which the factoryless value added has expanded. The factoryless production is characterised by a high value added compared to employee compensation. Accordingly, the operating surplus' share of the production grows when the factoryless production share grows, while the wage share falls.

Figure 7 indicates employee compensation, operating surplus and intermediate consumption as shares of manufacturing production. The production corresponds to the sum of the three (compensation, operating surplus and intermediate consumption) plus a small tax item[4], which has been left out of this account. It shows that the operating surplus catches up with employee compensation in 2016, and this is unprecedented. The employee compensation in manufacturing was approximately twice the amount of the operating surplus in 1990, and this ratio was the same in 1966, where the national accounts statistics begin.

[4] E.g. property taxes and vehicle excise duties on the properties and vehicles of the manufacturing industry minus subsidies for e.g. flex-jobs and modified duty jobs.

Figure 7 **Intermediate consumption, employee compensation and operating surplus, manufacturing**



Source: statistikbanken.dk/bbuhv and statistikbanken.dk/uhtp and own calculation; see appendix 1.

If we calculate the shares leaving out the factoryless part of the production, gross value added and intermediate consumption (the dotted lines in figure 7), we get a more moderate rise in the operating surplus share and a correspondingly smaller decline in the wage share.[5]

The factoryless value added and its effect on e.g. the relationship between compensation and operating surplus is a challenge to users of statistics. For this reason, it makes sense to supplement the present industrial grouping of production in the national accounts with some level of business model breakdown; see box 1.

GDP or GNI or NNI?

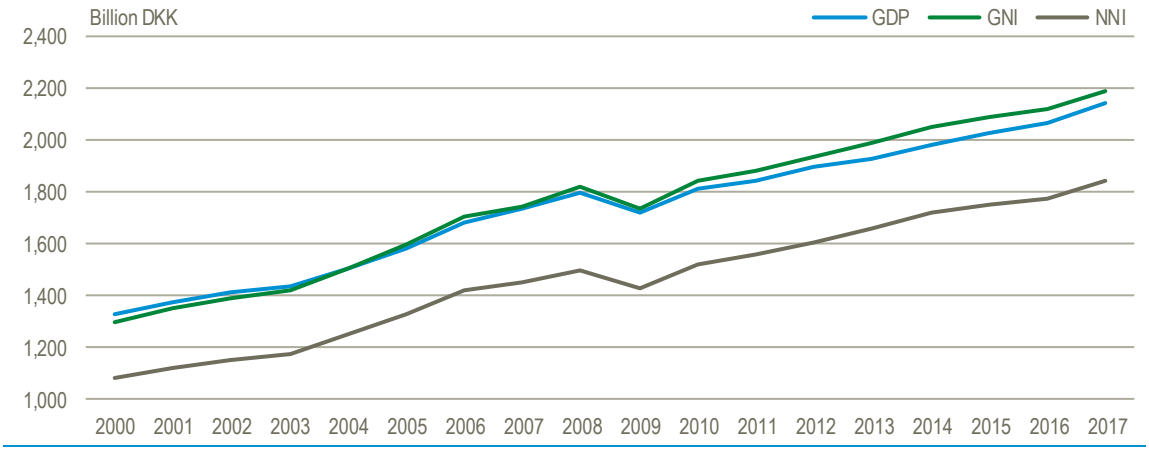
The Irish economy experienced a giant jump in GDP in 2015, because some major foreign enterprises located their headquarters in Ireland. As an alternative to the gross domestic product (GDP), it may be relevant in a situation like this to focus on the gross national income (GNI), which is also calculated in the national accounts.

Danish GDP comprises total Danish value added including taxes. In addition to GDP, GNI includes the net yield of the Danes' foreign net assets plus the compensation of employees residing in Denmark and working in e.g. Germany or Sweden, minus the compensation of employees residing abroad while working in Denmark. The net national income (NNI) corresponds to GNI minus total depreciation on the Danish capital stock including the intangible capital registered in Denmark.

The difference between Danish GDP and GNI is not tremendous; see figure 8. However, GNI has increased more than GDP over a number of years, because the Danes' foreign net assets have increased. NNI is less than GNI, and the depreciations account for the difference. The difference in the growth rate of GDP and the two national income figures is below 1.5 percentage points for all years shown.

[5] When calculating the adjusted shares, the operating surplus is reduced by all of the factoryless gross value added. Employee compensation has not been adjusted, but the factoryless production has been taken out of the denominator of the wage share. The factoryless production has also been taken out of the denominators of the intermediate consumption share and the operating surplus share. You may wonder why the share of intermediate consumption increases when the intermediate consumption of factoryless production is taken out, but taking factoryless production out of the share's denominator has a bigger effect. In 2017, the intermediate consumption share in the factoryless production was only 36 per cent against more than 60 per cent in the entire manufacturing production. In this way, the factoryless intermediate consumption only accounts for 5.5 per cent of manufacturing intermediate consumption, whereas the factoryless production accounts for 9 per cent of the manufacturing production.

Figure 8 GDP, GNI and NNI



Source: statistikbanken.dk/nan2

Since the yield on foreign-owned assets has been taken out of GNI, the GNI of a country will be more stable than its GDP, if major foreign enterprises were to move their headquarters and their intangible assets into the country, as it happened for Ireland in 2015. Even though the inflow of enterprise headquarters increases the factoryless gross value added and GDP of the receiving country, the impact on GNI will be smaller, because the foreign owners' investment profit is transferred to them regardless of the location of their headquarters and intangible capital.[6]

If the foreign owner of an enterprise has a dominant influence, the national accounts will not only reduce GNI by the foreign owner's share of the distributed profit, but by the foreign owner's share of the total net earnings after taxes and after depreciations. Accordingly, the foreign owner's share of the effect on depreciations would still need to be taken out of the calculation. Intangible capital is characterised by a high rate of depreciation, which is why a high inflow of foreign intangible capital increases depreciations considerably. This indicates that NNI, which corresponds to GNI minus depreciations, would be more robust than GNI in case of a sudden inflow of foreign headquarters.

In 2015, Ireland's GDP increased by 26 per cent at constant prices and 35 per cent at current prices. The simultaneous growth in the transfer of net earnings and profit out of the country moderated the effect on GNI, which increased by 25 per cent at current prices in 2015. This is less than the increase in GDP of 35 per cent, but still a heavy increase. The Irish NNI increased at a more moderate rate of approximately 10 per cent in 2015. The 10 per cent NNI increase better reflects the development in the 'Irish part' of the economy than the GDP increase of 35 per cent does.

In terms of the Danish economy, it is mostly a question of principle, as neither the inflow nor outflow of foreign headquarters has been of similar proportions.[7]

[6] If an Irish-owned enterprise purchases intangible capital abroad, both Irish GDP and GNI increase by the full profit. However, the inflow of foreign headquarters in 2015 did not reflect that the ownership was transferred to Irish residents, and GNI grew less than GDP.

[7] In principle, not in scope, Denmark has only one situation that resembles the Irish GDP problem and that is a single major payment from abroad in the first quarter 2017 for use of a Danish-owned patent. Patent income is export of services, and the concentration of the GDP effect in a single quarter reflects that it is not resolved until later which period the payment will finally cover.

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Appendix 1. Estimating factoryless production, GVA and intermediate consumption using statistics on the external economy

The factoryless goods production of Danish enterprises corresponds to goods processed and sold abroad plus goods processed abroad and sold in Denmark. Two items altogether, of which the latter and smallest one has not been dealt with in the text. In Statbank Denmark terms:

Factoryless goods production = Goods sold abroad in connection with processing abroad + |Other corrections, goods crossing the border in connection with processing abroad, current expenditures|

The associated factoryless intermediate consumption corresponds to goods purchased abroad in connection with processing abroad plus foreign work under contract plus Danish goods sent for processing abroad. Three items altogether, of which the latter and smallest one has not been dealt with in the text. In Statbank Denmark terms:

Factoryless intermediate consumption = Goods procured abroad in connection with processing abroad + Manufacturing services, import + |Other corrections, goods crossing the border in connection with processing abroad, current income|

For the record, the factoryless intermediate consumption also includes a part of the Danish enterprises' own intermediate consumption. However, this intermediate consumption is not described in statistics on the external economy, nor is it included in the figures drawn up here, which means that the factoryless intermediate consumption may be underestimated and the factoryless GVA may be overestimated. For example, if a Danish enterprise has both a factory in Denmark and one abroad, a share of the enterprise's marketing expenditure should be calculated as intermediate consumption in the production processed abroad. There are numerous examples of this kind of estimated breakdowns in the national accounts.

Factoryless GVA is factoryless goods production minus factoryless intermediate consumption.

Note: We have used Statbank Denmark terms for the above equations. The items on the right hand side of the equations are from the Statbank Denmark table BBUHV (Bridge table between external trade and balance of payments) except from manufacturing services (work under contract), which is from the Statbank Denmark table UHTP (International trade in services, imports and exports and items).

Vertical lines | round "Other corrections" indicate that the item is negative in the bridge table BBUHV, but here we use the numeric value. The equations are based on Statistics Denmark (2016).