

# **Investigating the factors driving Scotland's productivity gap with international countries - Executive Summary**

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## **Introduction**

In 2020, the Enterprise and Skills Strategic Board commissioned NIESR to develop a report investigating Scotland's recent productivity performance and the drivers of productivity. This work adds to the existing evidence base by looking closely at a set of similar benchmark regions in the EU to examine Scotland's relative performance and identify the drivers behind differences in productivity growth.

The report investigates the causes of the underlying productivity gap between Scotland and the comparator regions during the period 2009-2017, which allows for a robust picture of productivity performance during this period. It is important to note, however, that whilst the so-called productivity puzzle has been a long standing issue and the long-term drivers of productivity are complex, the economic landscape has altered dramatically since the time period covered by this report.

In 2009, all regions selected for benchmarking were in the second quartile of GDP/Capita by OECD ranking. By 2017 all comparator regions had seen a significant improvement in their GDP per capita, whereas Scotland's position had stagnated. Overall for the period of 2009 to 2017, productivity performance deteriorated for both Scotland and the UK.

NIESR examined the role played in explaining productivity differences by: capital investment, labour quality, total factor productivity (TFP), innovation and foreign direct investment. TFP is a measure of productive efficiency and is an unobserved residual after accounting for labour productivity gains and gains due to capital accumulation. TFP is broadly interpreted as a measure of technological progress but can include technological, cultural and economic factors. The methodological approach and limitations of the methodology are outlined in the annex.

## **Findings**

During the period analysed, NIESR found that roughly 40% of Scotland's labour productivity growth could be attributed to capital accumulation, and about 60% was due to improvements in TFP. Improvements in labour quality had an almost negligible effect on labour productivity growth over the time period.

Over the period, Scotland's labour productivity was 75% of the Vlaams Gewest region in Belgium, which was the top performing comparator region. Scotland was found to lag behind the productivity levels of all the comparator regions except for the East of England (the only other UK benchmark region).

Scotland was also found to lag behind the Vlaams Gewest region in all three aspects of capital, labour quality and TFP, indicating that there are significant gains for Scotland to make across all components of labour productivity.

### Capital investment

The analysis finds that growth in capital accumulation has been a significant feature in Scotland's overall productivity growth over the period analysed. However, relative to other European countries, the total level of capital accumulation in Scotland continues to rank towards the bottom. The absolute level of capital in Scotland is lower than many EU countries, although the growth Scotland has experienced in recent years has been a significant feature of Scotland's productivity improvement.

Additionally, Scotland's relationship with capital is unlike most of the UK, where in several regions the contribution of capital was negative, indicating disinvestment. Instead, capital in Scotland has made a positive contribution where it has been invested. The vast majority of capital investment over the time period took place in the North East of Scotland and capital has not been as prominent elsewhere in Scotland.

### Labour quality

Scotland has some of the highest tertiary education levels in the OECD. The analysis uses changes in employment shares of groups with different educational attainment levels as a metric for labour quality. This was found to have an almost negligible effect on productivity growth, as the analysis does not show changes in labour quality having an impact on productivity growth over the time period.

This result does not imply that Scotland's highly skilled workforce does not translate to productivity improvements. Education and skills do affect productivity both directly (by allowing individuals to perform more complex tasks) and indirectly (by enhancing the absorption of knowledge and technology spillovers). However, educational improvements have not been uniform. The share of highly educated workers increased over the time period observed, while the proportion of mid-educated workers decreased and the low education share of employment has been broadly stable. The limitations of the methodology are outlined in the annex.

### Innovation

The percentage of innovation-active businesses in Scotland is the lowest of UK nations. As with all other regions in the UK, this percentage had decreased from 2014-16 to 2016-18 and Scotland has experienced the largest decline in the percentage of innovation active businesses in that time period. There are implications for the decline in innovation active businesses as innovation is fundamental to boosting productivity growth and also important for the realisation of knowledge spillovers to other firms, industries and countries.

Additionally, Scotland ranked poorly compared to benchmark nations in R&D expenditure as a percentage of GDP. This ranking is almost entirely due to low R&D investment in the business sector. However, business R&D expenditure in Scotland has improved considerably over recent years.

Scotland's number of patents per million inhabitants and patents per R&D spend also ranked at the bottom of the comparator group.

## FDI

Scotland was found to have by far the greatest level of activity in FDI investment compared to the benchmark regions. Whilst these FDI inflows were found to be highly correlated with job creation, the research indicated that there was no clear positive relationship between FDI flows over the period and TFP growth for any of the regions analysed.

However, FDI will contribute to productivity growth through capital investment, and it is possible that TFP gains may materialise over time. It could be the case that although Scotland has been successful at attracting FDI, the benefits to the economy are not being maximised in terms of downstream impacts on suppliers.

## Total Factor Productivity

The analysis finds that there was no TFP convergence between the top performing regions and those just behind, indicating that the TFP productivity gap is widening over time. However, it was found that worse performing regions are growing at a faster rate, thereby closing the gap on the regions just behind the top performers.

The results indicate that the TFP pattern for Scotland appears to be unique compared with the rest of the sample overall. A 1% increase in the proportion of R&D spending was associated with an increase in TFP of 1.3%, which is a significant finding. However, R&D was not found to impact on technology transfers to less technologically advanced firms.

Human capital was not found to directly affect TFP growth, but does appear to promote Scotland's absorption of knowledge from leading firms. This absorption reinforces the benefit of having a highly skilled workforce, even if it does not directly result in improvements in labour productivity. This knowledge absorption element has significant implications for aiding what is often referred to as the 'long-tail' of UK firm productivity.

## Other factors examined and further research

Skill gaps, organisational factors and their effect on productivity were examined although there was insufficient data available for rigorous analysis. Skill demand and supply mismatches could be a key factor in explaining why labour quality is not contributing to productivity as may be expected. Scotland reported a higher number of gaps in management and leadership skills compared to other UK regions. Additionally, the number of vacancies has increased in the wake of Brexit and the pandemic.

Considering organisational factors, Scotland ranked close to the UK average in the number of managers who hold a graduate level qualification, or who participate in job related training. Scotland also had a higher union presence than the UK average, but there was less training activity among union members, and a higher incidence of flexi time, on-call working and zero hours contracts.

There is scope for further research in skills and organisational factors. Improvements on measuring labour quality should focus on the value and contribution of non-certified skills, training and vocational skill specifically, and on recognising the reinforcing effect of education and occupation on productivity. Further micro-level

analyses should look further at the relationship between a wider range of skills and productivity, ideally drawing from matched employee-employer data. Another area to investigate is the specific skills that will be necessary to improve labour productivity in an increasingly digitalised world, and which skills and occupations will be most rewarded by employers. A source of better data, beyond that included in typical business surveys or financial accounts is that offered by workplace surveys, which can be used to look at a wider range of contextual information and topics affecting workplace performance. It is of prime importance to exploit further links to other databases to enable deeper analyses of the drivers of productivity.

## **Conclusion**

The research finds that Scotland's labour productivity gap with the top performing EU comparator region was close to 30% over the period analysed, and there are productivity gaps across all of capital, labour quality and TFP.

Over the period, capital accumulation and TFP improvements have accounted for all of Scotland's labour productivity growth, but changes in labour quality appear to have had an almost negligible effect in this analysis. It must be noted, however, that the data issues with the measure used must be taken into account and that conclusions from this information require careful nuance.

Whilst FDI is a prominent source of capital flows, its contribution to TFP was not observed in the analysis. Conversely, R&D had a significant and strong direct effect on Scotland's TFP growth, more so than other regions.

Improvements in human capital appear to affect TFP indirectly by facilitating knowledge and technology transfers from leading firms to less advanced firms, which could have significant consequences for Scotland's "long tail".

Management practices could have a sizeable effect on productivity, but data was not available to compare this at an international level.

## **Annex: Methodology and limitations**

The research adopted a comparative perspective focussing on Scotland and a set of European benchmark regions. The analysis was undertaken for EU NUTS1 regions, for which a rich database was gathered of official data outputs, inputs, as well as a number of other economic and socio-demographic characteristics. A levels accounting framework was implemented to investigate different levels in productivity between Scotland and close comparator regions at the beginning of the period analysed. A dynamic growth accounting approach was then employed to map sources of regional productivity growth in the period of 2009 to 2017. This type of framework cannot address causality, but is an accounting tool that has been employed extensively in the empirical literature to explain cross-country and cross-industry productivity differences. Both the levels and growth accounting allow for the identification of the main contributing factors to labour productivity cross-differences, disentangling the effect of capital investment, human capital or TFP.

One limitation of the methodology is around how labour quality was measured. Labour quality has been measured by changes in the employment shares of groups with different educational attainment levels. Average wages by the same education group were then used as a proxy for worker productivity, to calculate the contribution of labour inputs to labour productivity. A potential limitation of this approach is that it is unable to formally incorporate qualification mismatches beyond those implied by the wages paid. For example, this work did not use survey data to draw from workers' perception on the match between their jobs and education to explore the link between skill and qualification mismatch and labour productivity. Due to small sample sizes, other productivity determinant characteristics such as age and gender were not considered. In addition, as the labour quality measure is a qualification based indicator, it does not capture "on-the-job" training and other soft-skills which can be acquired through professional activity and on-the-job training activities.

To measure capital accumulation, Gross Fixed Capital Formation was used. The limitation of this is that it does not pick up on significant parts of intangible investment (i.e. investment lacking physical or financial properties). Due to data limitations, the analyses that require the use of capital stocks only go to the year 2016.

There were data limitations around skills and organisational factors. There is not yet a comparable EU wide survey comparable to the UK Government's Employer Skills Surveys which is why only UK results are presented. Additionally, it was not possible to examine the role played by factors such as managerial practices, workplace performance or organisational factors on TFP performance due to a lack of harmonised regional data.



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