Managing Productivity in Welsh Firms: Interim Report

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Content

Executive Summary

This report is part of the Hodge Research Project and draws on an analysis of the results of a survey of a broad range of businesses in Wales. It seeks to provide a better understanding of how firms' management practices affect the productivity puzzle whereby Wales lags other countries.

To this end the report gathers new evidence on management practices against the background of a low productivity economy. It finds a wide range of managerial skills, but many firms in Wales exhibit poor strategic planning and limited management information systems for measuring and controlling performance.

Strategic management and leadership is found to be relatively difficult for many small firms where owner managers spend most of their time reacting to adverse events or opportunities. Relatively few firms articulate strategic goals and communicate them to staff. To some extent, this is a corollary of small size and limited managerial "bandwith".

While many firms in Wales consider productivity to be an important factor in shaping their overall performance, they often fail to identify and measure its various aspects so are not well placed to implement improvements.

Leadership and management deficiencies are coupled with low levels of intangible capital investment, especially relating to investment in software, intellectual property, and other forms of recorded knowledge. Such under-investment is likely to be a major factor hindering productivity gains and the growth of businesses. Underinvestment can be caused by lack of finance but also by lack of knowledge about the possibilities.

There was a clear stratification among the firms interviewed. Firms that had survived longer, and firms that were larger, both tended to have more productivity measures than younger and smaller firms. They also tended to have tighter managerial control, for example, in that senior management teams met more often and regularly monitored financial accounts and key performance indicators (KPIs). In a number of sectors, it is important for firms to get over a size threshold that enables them to employ more specialist managers.

Firms engaged in exporting tended to use more state-of-the-art management practices like lean production techniques and standard costing or other forms of benchmarking than firms with a purely domestic market. This seemed to indicate the benefit of competition in sharpening managerial performance but could also reflect degrees of managerial ambition. Go-getting firms tend to be the ones looking for sales opportunities elsewhere.

Asked about innovation, a number of firms said they had been stimulated by demands or suggestions from customers or suppliers. Future productivity performance will be partly determined by the types of supply-chains and networks in which firms in Wales are engaged. We recommend that policymakers pay renewed attention to stimulating such links.

More generally, policy support in Wales should focus on:

- Providing management education and training for firms to address their productivity challenge
- Intervention that should help firms to benchmark effectively with regard to improving management practices and competencies - given that one particularly interesting cause of productivity differences is different levels of management self-awareness
- Improving the intangible capital base of firms and reducing the continued digital and technological deficit within the Welsh economy

- Encouraging and assisting firms to export
- Improving inter-firm collaboration and networking activity and to improve the performance of trade associations and other similar organisations

In conclusion, it is clear that an underlying cause of the productivity gap between Wales, the rest of the UK, and economies in Europe and the Far East relates to firm-level management. Elements include the explicitness and consistency of the objectives firms set for themselves, combined with the control strategies; performance measures; measurement techniques; and the means used to foster innovation. These issues represent significant challenges not only for the firms themselves, but also for those that aim to provide them with effective support.

This Interim Report will be followed by a Full Report in early 2020.

The Hodge Research Project

Funded by the Hodge Foundation, the Hodge Research Project at Cardiff Metropolitan University's Creative Leadership and Enterprise Centre (CLEC) is a project that investigates the development of the Welsh economy. The main objective of the project is to identify the best measures and policy options for triggering transformational change in the Welsh economy.

The research into the productivity of Welsh firms is an enquiry into a fundamental area of the economy, and looks at ways to strengthen the capacity and competitiveness of firms. This is an ongoing project and the CLEC team are keen to receive comments and responses to this interim report and its conclusions and recommendations.

Comments and Suggestions

Where possible comments will be acted on and considered for inclusion in the final report, due in early 2020. Comments and suggestions may be sent to the team via the website of the project at https://www.welsheconomicchallenge.com/contact/

A Productivity Summit

Following the launch of the final report, a meeting will be held to discuss the research findings and implications for action by firms and policymakers during March 2020.

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1. Introduction

The Hodge Research project has undertaken a survey of a broad and diverse range of businesses in Wales seeking to find some answers to the 'productivity puzzle' (Figure 1). Welsh productivity has been below most parts of England and Scotland for a very long time. This report seeks to provide a better understanding of some of the more **micro**- elements of this productivity puzzle in Wales.

The objectives of the firms surveyed[1] relate to either increasing or maintaining their profitability, growing the business, and ensuring that the business remains competitive. However, many respondents consider that they face numerous challenges (such as a lack of information, skill gaps, and limited management capacity) which negatively impacts their performance levels.

The survey involved face-to-face interviews with 74 companies. The key focus was on understanding how productivity in Welsh companies is related to: (1) the types of **objectives** firms set for themselves; (2) the **strategies** they use to achieve these objectives; (3) the **performance** measures they utilise to measure success; (4) the **measurement** techniques they employ to quantify their performance.; (5) the **management practices** they employ to control outcomes; and (6) whether they attempt to **foster innovation** in the company.

We are particularly interested in the role of 'productivity' as a performance measure, as well as measures to control such as performance relating to management oversight, business strategy, and which management processes are employed. To this end, the survey considered issues such as changes to business organisation, new products, management structures and leadership capacity.

2. Productivity Trends

Productivity is usually measured as the rate of growth of Gross Domestic Product (GDP) per person employed (or per hour) - it's essentially a measure of labour productivity. A broader measure is provided by "total factor productivity" (TFP) which captures the efficiency with which inputs of both capital and labour are used. The higher is TFP, the more output is being produced for a given amount of inputs.

The survey sought to capture specific measures related to TFP that are currently used by firms in Wales. Many factors can help raise TFP, such as technological progress; higher skill levels, including management skills; an effective institutional environment; good infrastructure including digital.

For decades, improvements in TFP have been the main source of increases in GDP per head, but recently the UK has performed worse than its competitors and in Wales productivity is even lower.

At the macroeconomic level, reasons put forward for this slowdown include: 'secular stagnation', due to a lack of investment opportunities and diminished rates of innovation; globalisation; and monopoly power[2]. But none of these explanations on their own can explain the evidence.

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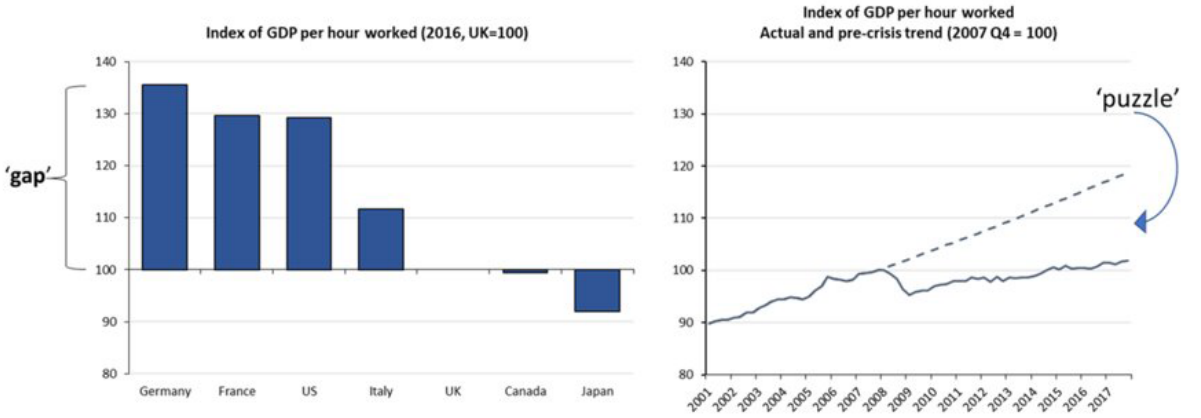
[1] See Annex 1 for details of the surveyed firms

[2] See: Gordon, R (2012), 'Is the US economic growth over? Faltering innovation confronts the six headwinds', NBER Working Paper No. 18315, available at http://www.nber.org/papers/w18315; Baily, M and Montalbano, N (2016), 'Why is productivity growth so slow? Possible explanations and policy responses', Hutchins Center Working Paper No 22.; Foda, K (2016), 'The productivity slump; a summary of the evidence', Global Economy and Development at Brookings Brief.; Haldane, A G (2017) 'Productivity puzzles' Speech given by Chief Economist, Bank of England.

Earlier research undertaken as part of the Hodge project examined the causes of regional productivity differences across the globe.[3] Productivity performance was found to be correlated with: levels of investment in higher education; investment in innovation (R&D); as well as the proportion of employment in high-tech services. For each of these measures, the performance of the Welsh economy was found to lag behind many leading regions.

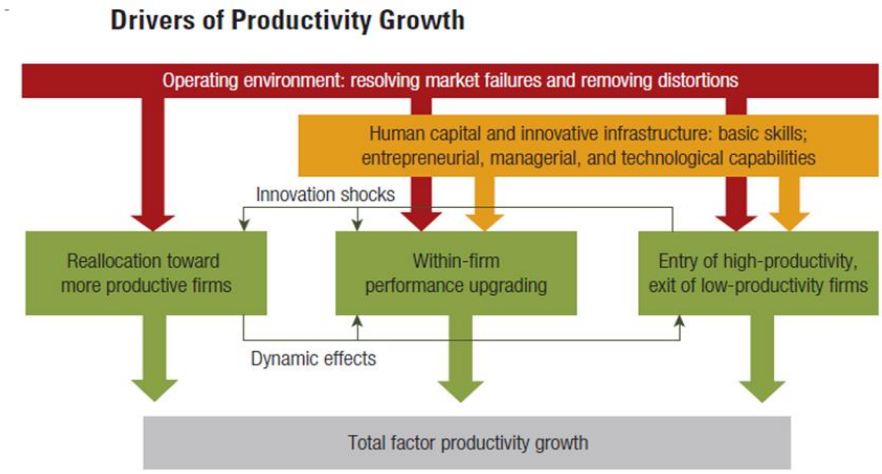
Figure 1: The UK Productivity Puzzle



Source: ONS (2018) and Business Productivity Review (2019) Industrial Strategy

To further understand why Welsh productivity remains low, the Hodge project has focused on analysing the microeconomic drivers of productivity within the individual firm. A useful schematic has been produced by the World Bank, as shown by Figure 2.

Figure 2: Drivers of Productivity Growth

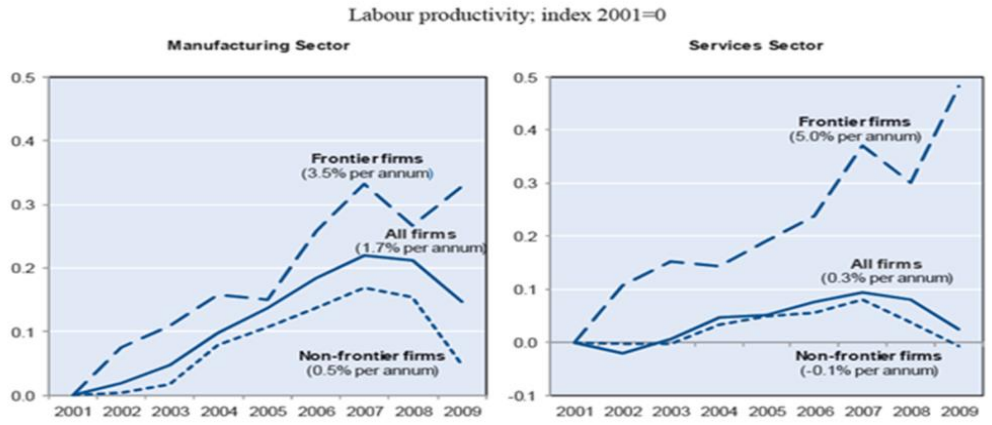


According to the World Bank[4] these drivers include: human capital - workplace skills including managerial skills; the innovation eco-system and the dynamic effects of diffusion; upgrading of performance within individual firms; and entry of high performing firms and exit of low performing firms.

[3] Holtham, G and Huggins, R (2017) 'What accounts for the success of regions? Examining the factors associated with economic development.' Welsh Economic Review.
[4] Cusolito, A P and Maloney, W F (2017) 'Productivity Revisited: Shifting Paradigms in Analysis and Policy,' World Bank

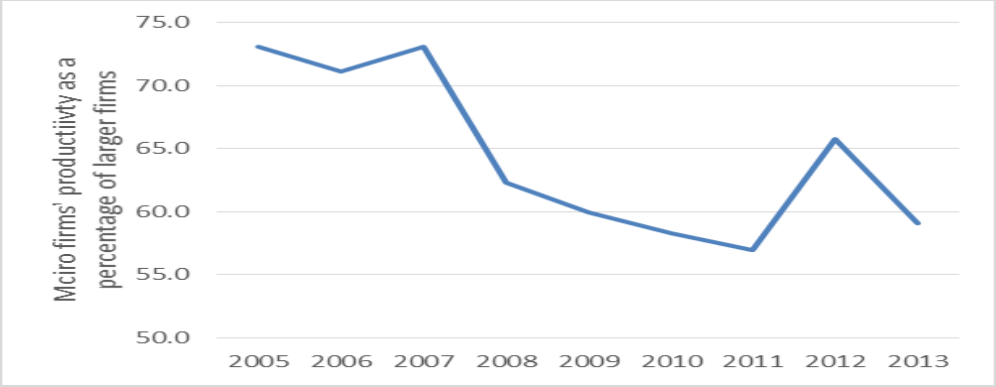
Recent research by the OECD has focused on the performance gap between high performing firms, (the so-called 'frontier' firms), and low performing firms (the 'laggards') (Figure 3).[5]

Figure 3a. Labour Productivity



Source: 'The Future of Productivity'; OECD, 2015 (Fig. 2,2)

Figure 3b: Productivity in Micro firms are also falling behind



Note: Calculations across all sectors by Stephen Roper at Warwick University from OECD 'Structural Business Statistics' : '*Increasing Productivity in traditional small enterprises' OECD, 2015*

3. The Welsh Context

The current Hodge study has focused on the productivity performance of individual firms and the role of managerial skills in raising it.

Firstly, we ask: can low productivity in Wales be explained by a disproportionate number of 'laggard' firms? To some extent this is true - low productivity regions have a higher proportion of low productivity, micro firms compared with higher growth regions:

The majority of the firms in the bottom 10% of the labour productivity distribution – "the laggards" – were micro businesses. These firms were predominantly in services industries and they were also younger firms (1 to 5 years old). Wales and the North East accounted for a disproportionately large share of firms in the bottom 10%.[6]

[5] Frontier firms - the top 5% in terms of GVA per employee, laggards are below median productivity.
[6] Understanding firms in the bottom 10% of the labour productivity distribution in Great Britain: "the laggards", 2003 to 2015 (ONS 2017)

The dispersion in productivity between firms, however, has been found to be much more important than the differences between regions[7] Indeed, the increasing gap between leaders and laggards appears to be the most significant cause of low productivity growth and reducing this gap is becoming an important policy objective.

What distinguishes leaders and laggards? Frontier (leader) firms tend to be exporters, they are open to international competition and are often foreign owned. They are also innovating firms. The laggards on the other hand appear not to be focused on innovation and the diffusion of new ideas to them appears to have stalled.[8] Prompting the question: 'Are their management practices underperforming?'

Various studies have identified poor management practices as a key reason for underperformance. e.g. studies by McKinsey have found a positive statistical correlation between management practices and TFP (where TFP includes - technology, public infrastructure, and management techniques). Also, similar research, finds "There is a much larger variation between firms within countries with a long tail of extremely badly managed firms".[9]

In the context of Wales, low productivity is partly due to a lack of representation in a number of key growth sectors such as marketed services. In addition, McKinsey has highlighted other causes of low productivity: low levels of competitive intensity; product market regulations and poor managerial practices, all of which can lead to companies pursuing under-performing business strategies.

These deficiencies together impede competitiveness and lead to low capital investment, low skills and sub-scale operations. The interplay between low productivity and micro-level determinants is particularly pertinent for Wales:

- Low productivity has built barriers to the creation of new, more highly skilled jobs.
- Low productivity has acted as a disincentive to innovation and technological upgrading.
- Lack of employer-led training have impeded productivity.
- Current managerial practices and low skill levels have perpetuated low productivity cycles and reduced capital investment
- Low capital investment is strongly correlated with low productivity.

It is clear that there is an important link between productive performance and skill levels, including managerial skills. The lack of investment in workplace training has been attributed to market failure that has led many companies to adopt lower skill strategies than their rivals in other countries. This can suppress demand for training and traps the economy in a low-skill equilibrium with low levels of innovation.

The key feature of this low-skill equilibrium, or skills trap, is that there has not been a huge requirement for an effective education and training system that delivers the skills businesses need to become more competitive and expand. This has widened wage differentials between skilled and unskilled workers.

[7] Haldane, A G (2017) 'Productivity puzzles' Speech given by Chief Economist, Bank of England.
[8] Roper, S. (2019). Innovation and productivity: How strong is the connection?, Enterprise Research Centre.
[9] Bloom, N, and Reenen, J (2006) 'Measuring and Explaining Management Practices Across Firms and Countries' CEP Discussion Paper No 716; Bloom N and Van Reenen J (2010) 'Why do management practices differ across firms and countries?', Journal of Economic Perspectives 24(1)

4. Research Approach: The Hodge Survey

The Hodge research has gathered evidence on the management practices that have perpetuated this low-skill equilibrium in Wales. It also looked at related issues such as the firm's propensity to export and the age and size of the firm.

The survey questions focused on:

- **Productivity in the company**: what measures are used to measure productivity;
- **Business Objectives**: what they are and what actions are taken to achieve them;
- **Controlling Performance**: management oversight and processes; business strategy;
- **Innovation and Leadership**: organisational changes; new products; leadership capacity.

Companies were asked to consider possible reasons for poor productivity performance including: lack of capital investment, particularly in new technology; limited management capacity; low levels of skills; and poor transport infrastructure.

The survey responses from 74 companies were analysed and indices of the responses for each firm were constructed, indicating which elements engaged managerial attention and which did not. The responses were used to rank the firms in terms of their propensity to improve productivity.

Firstly the indices of responses were compared to various firm characteristics: like length of time in business, how much of output was exported, economic sector, size of turnover, and location. The indices covered six areas of management decision-making: strategy formation; measuring performance; controlling performance; techniques of control; managing; and promoting innovation.

An examination of the relationship between the indices representing management practices and firms' characteristics threw up a number of statistically significant findings. Both older and larger firms were more inclined to measure various aspects of productivity. They were also more likely to control performance by having frequent meetings of the senior management team and to review monthly accounts and KPIs. That association does not establish causality but suggests that to survive and grow it is helpful if firms provide systematic management attention to quantitative measures of performance.

Most other indices were not significantly different across the groups of firms but there was one other noteworthy finding. Firms with a higher proportion of exports tended to score high on the index looking at techniques of control. This asked which of a range of techniques firms used such as Lean production; Inventory Control; and KPI Development. Evidently not all techniques are relevant for all firms but more of them were in use among firms subject to external competition.

In addition, access was made available to proprietary data compiled from Companies House records - focused on an analysis of companies' financial performance. Across over 700 Welsh based firms there is a significant correlation between the ratio of profit to turnover (a standard measure of profitability), and the size of the firm, measured by turnover itself. This is not surprising; highly profitable firms tend to grow. But the result suggests that the association between management control measures and size found in our sample probably implies an association between those measures and profitability too.

Our analysis of management practices suggests that we have found evidence of the techniques that older, larger, and export-orientated firms make use of to measure and control productivity. These techniques are correlated with success in terms of greater profitability. Therefore, one obvious way to address the productivity puzzle in Wales is to publicise and promote the methods used by these

successful firms, and to work with other firms to ensure they understand the importance of utilising these control techniques for the future growth of their business.

5. Productivity and the Firm

'Productivity' means different things to different firms. Some did not attempt to define it, while others used a range of definitions. Some respondents have also recently begun to think more about what 'productivity' means for their firm - reflecting the recent increase in attention given to this issue.

In general, their ideas about productivity were related to better management and ensuring continued good performance guided by their firm's objectives.

i. Productivity Descriptors used by Firms

- **Output per Hour or per Employee:** used by firms that can perform such metrics with relative ease: in sectors such as *Construction; Manufacturing; Food and Drink*.
- **Time and Budget:** This is more general and used in cases where job tasks are not closely matched to specific processes: *Construction; Manufacturing; Pharmaceutical*
- **Revenue and Chargeable Time:** made by business service firms in the main with a focus on charge rates and income: *Services*
- **Profit Margin and the Cost of Production:** allied to how the organisation operates; and how control of cost affects profitability: *Manufacturing; Services; Food Supply*
- **Efficiency:** a focus is on the better utilisation of resource; but also other objectives such as client satisfaction. *Manufacturing; Food Processing; Pharma; Construction*
- **Operational Factors and Lean Approaches:** highlights internal processes and its capabilities to improve; how organisations manage change *Manufacturing; Food Processing; Services; Construction*
- **Growth and Wealth Creation:** 'Productivity' is conceived as synonymous with growth, profitability and sales. *Construction; Manufacturing; Services; Food Processing*
- **Other Measures:** quality of life and work/life balance; recruitment of the right kind of people; maintaining a good working environment. *Manufacturing; Services*
- **Productivity Not Seen as a Relevant Issue:** Some companies did not think that productivity was a useful concept that could be applied to their company. *Services*

ii. Measuring Productivity

In order explore concrete actions, firms were asked what metrics they use for performance

Table 1: Responses made for each type of productivity

Type of Productivity	Labour	Plant and Equipment	IT	Physical Space (Buildings)
Measured	56 (76%)	30 (41%)	18 (24%)	21 (28%)
Not Measured	18 (24%)	44 (59%)	56 (76%)	53 (72%)
Total	74	74	74	74

Productivity of Labour

The majority measure labour productivity, but 24% of firms say that they do not measure it directly. Some respondents said it was difficult to measure directly in their business or sector.

Productivity of Plant and Equipment (P&E)

Some firms coupled this type of productivity with the productivity of IT. Others had no P&E or were service focussed.

Productivity of IT
Over 75% of respondents said they did not have a measurement for the productivity of their IT systems; indeed, most said they had no formal method for measuring the impact of IT investment.

Productivity of Buildings or Physical Space
Nearly 75% said that they did not specifically measure the productivity of their operational space. Others had some measures of the level of demand for space.

6. Planning

i. Strategic Planning
Regular Board and SMT meetings tell us something about the way that firms are managed in the short term, but the longer term strategic vision is also of importance. For small firms strategic planning is often not a strength. Without a clear objective it becomes difficult to set realistic intermediate targets. Therefore, firms were asked whether they had a strategic plan.

Table 2: Extent of Strategic Planning

Strategic Plan			
Full	**Part**	**Ideas: no detail**	**None – MD sets objectives**
26 (37%)	28 (39%)	11 (15%)	6 (8%)

Whilst 37% of firms say that they have a full strategic plan in place, they vary in form and function, from three-year plans to annual business plans. But 23% do not have a detailed strategic plan.

Even for those firms for whom strategic plans were in existence, these had often been developed by a narrow group of personnel. There was little appreciation that developing a strategic plan and accompanying budgets is a good opportunity to develop key staff.

ii. Objectives of Firms
Whilst performance targets were set for most firms, sectoral factors dominate: professional services firms had different ways in assessing performance to a engineering or a pharmaceutical companies. Some firms highlighted other aspirations such as the quality of product and service; the quality of life of employees; and wider environmental sustainability issues.

Firms were asked about the importance they attached to three key business objectives: profitability; business growth; and competitiveness.

Table 3: Business Objectives

Likert Scale Point	5	4	3	2	1	N/A
Profitability	47 (64%)	14 (19%)	7 (9%)	1 (1%)	4 (5%)	1 (1%)
Business growth	45 (61%)	12 (16%)	15 (20%)	0 (0%)	1 (1%)	1 (1%)
Competitiveness	22 (30%)	29 (39%)	12 (16%)	3 (4%)	4 (5%)	4 (5%)

The majority of the respondents chose profitability and growth as the focus of the business, although competitiveness was significant:

- Profitability - 92% (Likert Scale points 3-5)
- Business growth - 97%
- Competitiveness - 85%, but only 30% scored this objective at the top of the scale. This may be an indication that a short-term view is being widely taken.

Most respondents saw the three objectives as being interlinked.

Some of the respondents gave additional objectives:

- **Social Objectives** - the environment; to provide community benefits; staff well-being.
- **Staff Focus** - staff retention; providing jobs; improving skills.
- **Customer Focus** – providing good service; client satisfaction.
- **Technical Objectives** – continuous improvement at the operational level.

iii. Barriers to Improvement

Business performance improvement varied across the sectors as shown by Table 4.

Table 4: Importance of Barriers to Improved Performance

Barriers to Improved Performance	Likert Scores 3-5 for each sector (as % of Sector responses)					
	Construction	Manufacturing	Business Services	Consumer Services	Food/ Drink	Pharma
Information	47 %	40%	40%	66%	10%	66%
Skills	87 %	68%	66%	66%	80%	66%
Management Capacity –skills	73 %	60%	66%	66%	70%	66%
Management Capacity – no. of people	73 %	52%	66%	50%	80%	66%
Funding/ Finance	20 %	44%	33%	83%	50%	66%
Organisational Resistance	33 %	32%	40%	33%	40%	33%
Infrastructure – transport	33 %	28%	40%	17%	10%	33%
Infrastructure- digital	33 %	28%	27%	50%	10%	33%
Regulatory Bureaucracy	60 %	40%	40%	66%	50%	66%

- **Information (internal and sectoral):** Consumer Service and Pharmaceutical sector firms indicate that this is a major barrier but only 10% of Food and Drink firms agreed.
- **Skills:** Over two thirds of firms in all sectors reported this as a major barrier. It is of particular concern in the Construction (87% of firms) and in Food and Drink (80%) sectors.
- **Management Capacity – Skills:** The lack of appropriate management skills is also a major issue, although not for quite so many firms as the level of general skills.
- **Management Capacity – Numbers of people:** The availability of people to fulfil management functions is a major issue: Construction (73%) and Food and Drink (80%)
- **Funding/ Finance:** Consumer Services (83%), Pharmaceutical (66%) and Food and Drink (50%) found this to be a barrier to further improvement. But less so in Construction (20%)
- **Organisational Resistance:** This was not seen as a major barrier to improved performance.
- **Infrastructure – Transport:** This was not considered to be of high importance.
- **Infrastructure – Digital:** Apart from the Consumer Services sector (50%) most firms do not regard digital infrastructure to be a barrier to improved performance
- **Regulatory Bureaucracy:** Relatively high percentages of firms in all sectors regard this to be a barrier - although regarded by many as just part of the conditions for conducting business.

iv. Enablers for Improved Performance

The importance firms assigned to six specific areas to improve management performance was explored, with Table 5 indicating the importance of areas of management performance by sector.

Table 5: Importance of Areas of Management Performance

Areas to Improve Performance	Likert Scores 3-5 for each sector (as % of Sector responses)					
	Construction	Manufacturing	Business Services	Consumer Services	Food/ Drink	Pharma
Operations Management	93%	88%	60%	83%	90%	100%
Use of Technology	93%	84%	73%	83%	90%	100%
New Investment	33%	80%	66%	100%	100%	100%
HR -training	93%	80%	80%	100%	90%	66%
HR - recruitment	60%	72%	73%	100%	80%	33%
Leadership	100%	80%	80%	100%	70%	100%

Although there were some interesting variations between sectors, nearly all of the areas scored highly for nearly all sectors. Some areas to note include:

- only 33% the Construction firms indicated high importance to new investment, whilst only 33% of Pharmaceutical sector firms scored recruitment as an important issue
- only 60% of firms in Business Services thought that Operations Management rated highly, and 60% of Construction firms thought the same about recruitment
- lower percentages of Business Services firms assigned high importance to all of the areas that would affect management performance than for firms in other sectors

It is noticeable that the majority of firms scored these areas as being of high importance, but formal systems were often lacking.

7. Controlling Performance

i. Board and Senior Management Team (SMT) Actions

Regular management team meetings to share knowledge about performance is known to be an important driver of productivity.

Firstly, respondents were asked about the frequency of Board and SMT meetings. In many firms the Board was, in practice, not very distinguishable from the SMT. Some responding firms, in fact, did not operate with a Board, whilst others did not have a defined SMT structure (see Table 6).

Table 6: Frequency of Board and SMT meetings

Meetings	Annually	Half Yearly	Quarterly	Every two months	Monthly	Weekly	Daily	N/A or no board
Board	1 (1%)	3 (4%)	19 (26%)	3 (4%)	37 (50%)	3 (4%)	2 (3%)	6 (8%)
SMT*	0	1 (1%)	0	1 (1%)	28 (38%)	36 (49%)	0	6 (8%)

Secondly, respondents were asked about what they focussed on during meetings (Table 7)

Table 7: Analysis during SMT meetings

	Monthly Accounts	Set and Review Targets	Discuss KPIs
Virtually every meeting	48 (65%)	47 (64%)	43 (58%)
Occasionally	14 (19%)	18 (24%)	20 (27%)
Never/ NA	12 (16%)	9 (12%)	11 (15%)

The majority of firms (between 58% and 65%) discussed at least one of the three areas at virtually every meeting. However, it is of concern that a relatively high percentage of firms only occasionally (or never) discuss these issues at SMT meetings: 35% of respondents for Monthly Accounts; 36% for Targets; and 42% for KPIs. A worrying number of firms never set targets or discuss accounts.

ii. Techniques and Procedures for Control

Planning and controlling the business were examined together since without a plan (stating clearly, objectives, targets and outcomes), control becomes difficult.

To enquire what concrete management steps are taken, firms were asked what techniques, procedures and software were utilised. Management techniques depend to some extent on firm size and sector but it is noticeable that many firms are not using standard procedures (Table 8).

Table 8: Techniques and Procedures used for Management

Techniques and Procedures	Across the Business	Some Areas	Not at All;
Lean	14 (19%)	21 (28%)	39 (53%)
Standard Costing	29 (39%)	12 (16%)	33 (45%)
Project Management	38 (51%)	23 (31%)	13 (18%)
Inventory Control	36 (49%)	10 (14%)	28 (37%)
KPI Development	41 (55%)	22 (30%)	11 (15%)
Benchmarking	23 (31%)	30 (41%)	21 (28%)
Budget for Staff Development	29 (39%)	20 (27%)	25 (34%)

Lean Approaches: 'Lean' is now applied in most sectors not just manufacturing. In the sample, 78% of companies were in industry sectors (Construction, Manufacturing, Food and Drink) where adopting 'Lean' could be thought to provide the most positive benefit. 37% of these firms, applied 'Lean' approaches across the business or in some areas. 53% of the sample did not apply 'Lean'.

Standard Costing: This technique is most effectively used in the production of a standard product.

Project Management: 82% of firms adopted project management across the business and/or in some areas. This suggests budgets exist to monitor and control performance.

Inventory control (IC): 49% of firms indicate that they apply IC across the business, whilst 63% exercise some form of inventory control. There is little appreciation that inventory imposes a cost on firms and reduces the cash available - it is a major cause of firms running out of cash.

KPI Development: Many of the KPIs used were finance related but to better assess future performance other indicators are required. These indicators vary according to sector but can include staff turnover; time spent on re-work; and tender win rate.

Benchmarking: 72% of firms said that they undertook benchmarking to some degree in their business, although this was mostly internal benchmarking. The use of external benchmarking which identified key differences in relative performance with sector peers, was less likely to be used.

Budget for Staff Development: Only 39% of firms had a staff development budget applied across the business and a further 27% applied a staff development budget to some areas. The lack of a staff development budget probably reflects a short-term planning horizon.

iii. The Use of Management Software

Some firms still have some way to go to embrace IT and Management software such as cloud computing and e-commerce: 57% of firms do not use e-commerce (Table 9).

Table 9: The Use of Management Software

Software	Yes	No	N/A
Cloud Computing	57 (77%)	14 (19%)	3 (4%)
E-Commerce	32 (43%)	21 (28%)	21 (29%)
Accounting	71 (96%)	0 (0%)	3 (4%)
Customer Relationship Management (CRM)	39 (53%)	27 (36%)	8 (11%)
Supply Chain Management (SCM)	30 (41%)	30 (41%)	14 (18%)
HR Management	38 (51%)	27 (36%)	9 (13%)

Similarly, relatively high percentages of firms do not use CRM, SCM, or HR Management software, raising questions about their ability to monitor information generated within the firm.

Although nearly all firms used accounting software, this tended to be used more as a recording tool than as management information - accounting software was not being used to its full potential.

iv. Leadership

The importance of leadership was regarded as high by most firms in terms of improving performance (86% of firms), driving innovation (80%), and setting targets (80%) (Table 10).

Table 10: The Importance of Leadership in Various Aspects of Performance

Likert Scale	Improved Performance	Driving Innovation	Setting Targets
5	55 (74%)	48 (65%)	48 (65%)
4	8 (11%)	8 (11%)	8 (11%)
3	1 (1%)	4 (5%)	3 (4%)
2	0	1 (1%)	1 (1%)
1	1 (1%)	2 (3%)	2 (3%)
N/A	9 (12%)	11 (15%)	12 16%)

8. Managing for Change and Innovation

Respondents were asked about changes they had made and whether they had some kind of formal scheme to promote innovation, and which networks, if any, were significant (Table 11).

i. Changes over the Previous Three Years :

- **Operational Management Change (OMC)**
  Most firms in most sectors had made changes in their operation management - only firms in Business Services fell below 50%.
- **Employee Development and Training (EDT)**
  A high percentage of firms in all sectors claimed that they have engaged in employee development and training. But not many structured examples were provided.
- **SMT and Leadership Development/Training (SDT)**
  SMT leadership development and training was also claimed to be well supported, although the percentages for Consumer Service and Pharma firms were lower (50% and 33%).
- **Organisational Structural Change (OSC)**
  Although changes in organisational structure had been conducted by many firms, there were substantial numbers that did not consider them important (between 38% and 47%).
- **Investment in Technology (IiT)**
  Most firms had invested in technology over a three-year period (between 66% and 100%).
- **Changes in Management Information Systems (MIS)**
  A high percentage of firms had made changes to their Management Information Systems.
- **New Product Development (NPD)**
  Only 33% of Construction and Pharma firms had introduced new products. But generally, respondents regarded new product developments as important.

Table 11: Changes made in Firms over the previous Three Years

Changes over three years	Likert Scores 3-5 for each sector (as % of Sector responses)					
	Construction	Manufacturing	Business Services	Consumer Services	Food/ Drink	Pharma
Op Management	13 (87%)	22 (88%)	7 (47%)	5 (83%)	7 (70%)	100%
Employee development /training	14 (93%)	21 (84%)	13 (87%)	5 (83%)	9 (90%)	66%
SMT/ leadership training	14 (93%)	19 (76%)	9 (60%)	3 (50%)	7 (70%)	33%
Org Structure	9 (60%)	18 (72%)	8 (53%)	4 (67%)	6 (60%)	100%
Investment in Tech	13 (87%)	19 (76%)	14 (93%)	6 (100%)	8 (80%)	66%
Management Information	13 (87%)	22 (88%)	12 (80%)	6 (100%)	7 (70%)	100%
Product Development	5 (33%)	17 (68%)	10 (67%)	6 (100%)	6 (60%)	33%

Internal Schemes to Promote Innovation
The Survey asked firms about their formal reward schemes and feedback from workers' meetings; or other informal methods of promoting innovation.

The majority (75% of firms) did not have a formal reward scheme in place. 73% said that they did obtain feedback from workers' meetings. Only 24% said that they had both a reward scheme and obtained workers feedback from meetings. A large proportion of companies do not engage with their staff in any way to promote innovation, as indicated by Table 12.

Table 12: Responses to schemes and feedback

Schemes and Feedback	Number (and %)
Did not have a reward scheme	53 (75%)
Did have a reward scheme	18 (25%)
Obtained feedback from workers' meetings	52 (73%)
Did not obtain feedback from workers' meetings	17 (24%)
Had a reward scheme and obtained feedback from workers' meetings (Y,Y)	17 (24%)
Did not have a reward scheme but did obtain feedback from workers' meetings (N,Y)	35 (49%)
Total number of responses	71 (100%)

Some respondents commented that they made formal efforts to encourage innovation:

- External stimulus: the driver for innovation is seen primarily as the client, i.e, user-led innovation.
- Light-touch involvement of staff: an expectation that the production of new ideas is expected as part of staff duties and roles.
- Management-led approach: discussion about innovation and change is consciously led by the firm's management. Very few examples were found.
- Financial Incentives: a structured approach to incentivise new ideas, but was not common.

ii. External Networks
A number of respondents indicated that they were members of networks. Forty-nine respondents specified particular associations or clubs, whilst others declare that they engaged in unspecified networking activity more generally. Construction Sector firms quoted the most specified network involvement followed by Manufacturing and Pharmaceutical. Cross-sectoral networks included the CBI Wales, the FSB, Chambers of Commerce, and some government-supported networks.

In general, networks were used to different degrees, but were rarely seen as transmitters for new ideas. It appears that few firms are able to fully exploit such sources of information and to act upon them, whilst it is apparent that those networks that were quoted offered different levels of support and service, which were in turn utilised in a variety of ways.

The importance of collaboration for small firms, including the use of shared resources, joint working, and mutually supportive exchange of information and expertise figured in many of the survey interviews. The expanding numbers of small and microbreweries may illustrate the importance of this, for which the provision of bottling and/or canning lines is moot. There would be economies of scale in sharing such facilities in a way that allows firms to cut production costs but be able to retain and promote their own branding. The role of trade associations and similar networks to promote such collaborative opportunities for sharing resources and reducing overheads is often underexploited or not available, and is an area in which government policy is likely to bear considerable fruit.

9. General Discussion of Survey Results

This section provides a general summative analysis in respect of the understanding of the concept of productivity within Welsh firms. It then analyses the practices they employ to enhance this productivity and the challenges they face as they seek to address performance issues. As part of this analysis it draws specific attention to the fact that many firms in Wales are poor at strategic planning and have limited management information systems in place for measuring performance. To some extent this could explain the long tail of the productivity distribution in Wales and the preponderance of underperforming firms.

i. 'Productivity' and 'Value' are Broad Rubric Concepts

Of particular interest to this study is how 'productivity' is conceptualised and measured across firms in Wales, with the underlying finding being the variety of the use of the term. Some firms did not directly employ the term in relation to their business strategies, although they used the term indirectly with regard to more intermediate objectives.

Standard definitions such as 'output per hour per employee' are well utilised, and the efficiency of other forms of capital – especially physical capital - are also used by some businesses. Other respondents seek to examine the 'value' they are able to generate and capture. Generally it relates to the broader benefits provided to customers and also to suppliers.

With regard to customers, the survey findings indicate that a firm is only as good as its customers, with discriminating customers 'forcing' a firm to improve. The toughest customers are often other firms, so firms selling B2B are more productive than firms selling to the general public. Similarly, Porter (1990) finds that demand conditions can shape the rate and character of improvement and innovation by a nation's firms. Firms with the most discriminating customers are often those that are exporting. Selling abroad generally requires engaging in more intense competition and we found Welsh exporters were more likely to be using a range of rigorous control techniques.

Furthermore, it is often through the networks underpinning innovation processes that firms access knowledge (Tomlinson, 2010). At a more operational level, the generation of value is largely considered by firms to stem from the speed and success of changes with regard to product and process development. However, for most businesses, whilst recognising this value-chain, they acknowledge they lack the relevant expertise, skills and tools to measure their efficiency at the relevant parts of the chain.

ii. Support Required to Improve Performance Measurement

A lack of knowledge within firms indicates an important role for public policy in the field of business support in Wales. There is a need to offer businesses access to education and training initiatives that provide sources of knowledge dedicated to better understanding and measurement of business performance. Although this is not an issue limited to Wales, it is the case that its industrial structure, especially with a preponderance of SMEs operating within non-tradable sectors, means that more firms in Wales are likely to lack this knowledge compared with firms in more advanced regions.

This is made manifest by the fact that a number of responding firms indicated that issues related to productivity and its measurement are not relevant to their operation or performance. Furthermore, whilst a positive significant number of firms (75%) seek to address in some way the productivity of their employees, only a minority of firms address the measurement of their physical capital, and even less so in the case of intangible capital.

iii. Intangible Capital Investment

Intangible capital, particularly in the form of ICT, is known to be increasingly important to improved productivity performance.[10] The finding that more than three-quarters of surveyed firms indicate that they do not consider measures of ICT relevant, once again suggests a role for business support providers in Wales to better inform businesses of the strong relationship across sectors and industries between intangible capital and business performance.

Perhaps one of the most telling findings of the study is the lack of structural intangible capital investment – such as recorded knowledge, processes, software and intellectual property – across the cohort of firms surveyed. For example, only a few firms indicated the use of software in relation to productivity assessment, which is particularly surprising given that a sizable proportion of these firms are operating within technology-based sectors.

Scotland and Ireland have paid considerable policy attention to addressing failures by firms, supporting them to invest appropriately in intangible assets and technology, with evaluations indicating some significant successes from these policies. Although this area has not been totally overlooked by policymakers in Wales, the results of this study suggest that policies seeking to highlight the benefits of investing in ICTs to improve performance should be further promoted.

In terms of controlling performance, it is notable that only one responding firm directly acknowledged the role of automation and robotic technology. Therefore, this study hints at a 'Digital Deficit' across Wales that requires immediate and long-term attention. Interestingly, the report 'Digital Maturity Economic Impact Report for Wales 2018' provides compelling evidence that those businesses investing in digital technologies in Wales have achieved significant additional improvements in turnover.[11]

iv. Strategic Management and Leadership Capability

The decision to invest to support business development is closely linked with the strategic management and direction of the business. In this respect the study finds a mix of formality in relation to the strategic processes within a firm. Some firms have clearly defined and aligned organisational processes and structures to undertake these activities. However, in a significant number of businesses, management appears to have a far more ad hoc approach to controlling the direction of the business. This confirms the findings from the literature examining the limitations of strategic management stemming from time and cost issues.[12]

It is an indication of the priority – or lack of – that some business leaders give to addressing strategic development. Indeed, as the findings show, firms become more productive as they grow, which is likely to be due – amongst other issues – to limitations of management attention span and the need for the firm to hire specialist managers to improve performance in specific areas.

As the survey finds, the majority of leaders considers themselves to be at the helm with regard to factors concerning improving performance, driving innovation, and target setting. However, the lack of a strong strategic orientation in a number of businesses draws into question the efficiency of this

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[10] Atkinson, R. D. (2013). Competitiveness, Innovation and Productivity: Clearing up the Confusion. Washington DC: The Information Technology & Innovation Foundation.

[11] WERU (2019) Digital Maturity Economic Impact Report 2018, Cardiff: Welsh Economic Research Unit, Cardiff Business School.

[12] Wiklund, J and Shepherd, D (2003). "Aspiring for, and Achieving Growth: The Moderating Role of Resources and Opportunities." Journal of Management Studies 40 (8): 1919–1941.

leadership. This is an acknowledged management issue that leadership initiatives such as Cardiff at Metropolitan University have sought to address in Wales for a number of years. [13]

The survey also finds that the more graduates and apprentices a firm has the more efficient it is, although this may be a signal more than cause and effect. Simply hiring graduates and apprentices many not necessarily make a firm more efficient, but efficient firms are not afraid to hire people who know more than the existing management, and understand the importance of building and maintaining know-how.

The survey indicates that firms need to grow in a context of stability with regard to its ownership, leadership and management. A limited number of takeovers may be positive by introducing fresh resources, but if ownership or management changes more frequently (the firm is likely to go backwards. In essence, the learning-by-doing fostered through open innovation requires sound collective memory. The strength of such a system is that it fosters re-combinations of skill and technology, along with experiments in organisation and markets.[14]

In general, open innovation practices are an important source of productivity gains through investment in knowledge spillovers. Importantly, such spillovers are increasingly conceptualised as a regional phenomenon, resulting in an enhanced focus on regions as key units through which economic growth can be best understood.[15]

v. Well-Being and Social Returns

In terms of strategic management perspectives, some firms noted that their key objectives relate to well-being and social returns to broader communities and employees. The findings indicate that a cadre of firms in Wales are clearly committed to welfare and well-being development, not as an alternative to underpinning economic objectives, but operating in tandem.

Links between improved productivity and improved well-being are increasingly found within the literature, and may be a hidden long-term 'competitive advantage' for Wales.[16] The focus of policymakers, especially the Welsh Government, has for a number of years sought to mobilise social entrepreneurship as a means of enhancing economic development and productivity. This study suggests that this agenda is beginning to permeate strategies and objectives at the micro level.

vi. Productivity and the Innovation Paradox

The research has identified a range of factors relating to business innovation in Wales, which indicate that it is evolving in a 'healthy' and positive way, but our quantitative analysis did not find that 'innovation' itself is correlated with measures of success. But, the study goes some way to address questions relating to our understanding of the factors within a firm's environment that encourage or discourage innovative activity.[17]

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[13] See https://20twentybusinessgrowth.com/

[14] Saxenian, A. and Sabel, C. (2008). Roepke lecture in economic geography: venture capital in the "periphery": the new argonauts, global search, and local institution building. Economic Geography, 84 (4), 379–394.

[15] Audretsch, D. B. and Lehmann, E. E. (2005) Does the knowledge spillover theory of entrepreneurship hold for regions?. Research Policy, 34 (8), 1191–1202.

[16] Huggins, R & Thompson, P (2011). Well-being and competitiveness: are the two linked at a place-based level?. Cambridge Journal of Regions, Economy and Society, 5(1), 45-60.

[17] Hall, B. H. (2011). Innovation and Productivity. NBER Working Paper 17178. Cambridge, MA: National Bureau of Economic Research.; Atkinson, R. D. (2013). Competitiveness, Innovation and Productivity: Clearing up the Confusion. Washington DC: The Information Technology & Innovation Foundation.

In Wales, some of the strategic limitations concerning innovation provides evidence of an 'innovation paradox' in Wales; i.e. as a result of its deep-rooted economic problems it has been in receipt of significant public funding targeted at fostering innovation and productivity gains but positive outcomes appear rare. Evaluations often indicate little in the way of improved performance. The inability of regions such as Wales to effectively utilise the spending made available for innovation suggest there is a lack of absorptive capacity, in both the public and private sectors, to make good use of such funding.

The lack of a motivation to grow across many firms could also be an issue. A heightened growth motivation has been associated with businesses seeking opportunities to innovate [18] This relationship is likely to be moderated by the resources available, including those associated with human capital, resulting in regions such as Wales experiencing deficits in terms of both innovation and productivity performance despite influxes of funding to address these very deficits.[19]

An important task for public policy research is to characterise accurately the 'interplay of causal factors in innovation expenditure'. There is a paucity of evidence relating to how expenditure should be targeted across a range of areas of activity. As a means of addressing this policy gap, this study has provided a range of pointers as to where firms in Wales can best reap productivity rewards from enhanced business support in areas such as management and leadership development, investment in intangible assets, and the promotion of business change and innovation.

[18] Morrison, A Breen, J. and Ali, S. (2003). "Small Business Growth: Intention, Ability, and Opportunity." Journal of Small Business Management 41 (4): 417–425.
[19] Wiklund, J and Shepherd, D (2003). "Aspiring for, and Achieving Growth: The Moderating Role of Resources and Opportunities." Journal of Management Studies 40 (8): 1919–1941.

10. Conclusions and Policy Implications

This final section summarises the key conclusions and considers their implications:

- **Addressing the productivity challenge** - Firms in Wales consider productivity to be an important factor in shaping their overall performance. However, many firms are not well versed in understanding the nature of productivity and how it can be improved.
- **Improving and developing relations with stakeholders** – Productivity performance is linked to the ability of firms to develop new relations with customers and suppliers.
- **Low levels of intangible capital investment** – Across Wales levels of investment in software, intellectual property and other forms of recorded knowledge are often woefully low. This under-investment is likely to be a major factor hindering the growth of businesses.
- **Relatively poor strategic leadership** - Strong strategic management and leadership is an important factor in productivity performance, but many managers do not pay enough attention to it. This is due to a number of issues such as business size and time constraints.
- **Human capital investment** – There is a significant relationship between firms investing in human capital and their overall business performance. Investing in educated and skilled workers is likely to either directly impact on performance or act as a signal for other highly educated workers to join these firms and improve future performance.
- **Business stability** – Frequent changes of ownership and management within firms in Wales can lead to instability. It inhibits the development of relationships that aid learning-by-doing practices. A vicious circle seems to be developing in some firms whereby poor performance triggers changes of management/ownership, with these changes themselves resulting in a further reduction in performance.
- **Well-being** – Some firms in Wales are focused on ensuring that their strategic objectives relate to wider issues concerning the well-being of their employees and communities. This is potentially a positive feature of the economy of Wales and provides an interesting connection with public policy developments such as the Future Generations Act.
- **The regional innovation paradox** – Economically lagging regions are often not able to take significant advantage of public investment made available to stimulate innovation. A lack of investment relating to human capital, intangible capital, and strategic management in many firms in Wales acts as a factor limiting the positive effect of financial incentives.
- **Growth businesses** – A relatively hidden factor impacting on productivity in Wales concerns the extent to which firms are actually motivated to grow their business. This can lead to a lack of investment in the types of productivity driving assets indicated above. There appears to be a tail of micro-businesses in Wales with little ambition to grow - but it does not appear to be the main constraining issue.
- **The complexity of the productivity puzzle in Wales** – This study has shown that there is a complex mix of factors both internal and external to firms in Wales that are hindering productivity gains. Unless these issues are addressed in an integrated and systematic fashion firms in Wales will continue to struggle to reach their full potential.

These specific issues should be addressed in any new Industrial Strategy for Wales with particular attention being given to the following strategic areas:

- Policy support that provides education and training for firms to address their productivity challenge. We acknowledge that there already are some initiatives in relation to these challenges, but they continue to be implemented in a piecemeal and uncoordinated manner.

- Many firms in Wales would benefit from a greater focus on benchmarking, in particular laggard firms against frontier firms with regard to improving management competencies - given that one particularly interesting cause of productivity differences is the management performance of individual firms.
- Significant opportunities exist for targeted interventions using a variety of regional policy instruments to raise performance, and in particular to improve the intangible capital base of firms.
- Future productivity performance of firms in Wales will be partly determined by the types of supply-chains and networks in which they are engaged. In the past significant policy attention was paid to the encouragement of these interactions through the work of the Welsh Development Agency, specifically its efforts to connect local suppliers to large inward investors. However, such activities have waned and a renewal of efforts to stimulate these links in Wales is required.
- Finally, any form of policy development addressing the productivity challenge should pay particular attention to reducing the Digital and Technological Deficit. This remains of paramount significance as it is likely to remain significant drag on the performance of the Welsh economy.

Annexes

A1: The Sampling Framework

Individual firms were identified from a range of sources including Welsh Government sector-based lists and existing internal distribution lists. The research team then convened in a roundtable session in order to agree the final list of firms to be approached. There were essentially two parts to this challenge - firstly to relate the chosen sample to the industrial structure of the Welsh economy, while secondly on a firm by firm basis identifying a group of respondents who would offer the mostly likely opportunity to engage with in a meaningful conversation on the productivity.

Wherever possible a suitable named contact was identified (relevant senior decision-makers; MD, CEO and the like) in advance, with these individuals contacted by letter to request their participation in the project. In the event of non-response from the company, a number of chase-up contacts were made, with companies ultimately replaced in the sample if necessary.

In terms of the actual data gathering, this took the form of a face to face interview, guided by a questionnaire. This contained a number of fixed response and Likert scale questions, augmented by opportunities for interviewees to provide explanatory information and raise other issues. Interviews lasted between 1 and 2 hours and took place during late 2018 and early 2019.

Table A1: Population of Firms and Sample by Sector (% total firms, excluding public administration)

Sector	UK	Wales	Sample (no.)	% Wales GVA
Manufacturing	5.4	5.9	44.6 (33)	27.5
Services	59.6	49.4	32.4 (24)	40.8
Construction	13.3	13.2	18.9 (14)	8.1
Primary / Utilities	0.6	0.7	4.1 (3)	4.7
All other sectors	21.1	30.8	-	18.9

Source: UK Business Counts - enterprises by industry and employment size band 2018 (via NOMIS), Regional Accounts, Office for National Statistics (GVA figures are for 2017).

Note: Based on major SIC groupings. Excludes Public Administration, Education and Health. Also, Services, as defined here, excluded Motor Trades, Wholesale and Retail.

Table A1 shows a comparison by industrial sector. We used broad groupings based on official statistics employing SIC data; at the firm level they may not necessarily reflect the actual activities engaged in. However, they provide a useful benchmark. Just under 45% of the sample firms were involved in some form of manufacturing; this is clearly a far higher proportion than found in the firm populations at the Wales or UK levels (between 5-6% only); however when the sector's contribution to total GVA is considered, the important role played by manufacturing is apparent. The other sectors we identify are broadly in parity in terms of the distribution of firms within the economy. Overall, these sample sectors represent over 80% of Welsh private sector GVA.

A2: Statistical Analysis of Questionnaire Responses

How do questionnaire responses vary with characteristics of the firm? A preliminary exercise has been carried out on stratification of the sample according to five characteristics:

1. **Broad sector**: construction, manufacturing and services. (primary producers, agriculture and mining were omitted because the samples were too small).
2. **Age**: firms five years or less, 6 to 15, over 15. (the original classification of 5-10 resulted in unbalanced samples; most firms interviewed were over 10 years old).

3. **Size**: turnover below £2m annually, £2m-10m, above £10m
4. **Region**: North, Mid-Wales, South-east and South West.
5. **Exporter**: not at all, mainly to rest of UK, UK and abroad

To classify questionnaire responses we arranged the questions into five groups relating respectively to: how do firms measure productivity; what measures they take to control performance; how they set strategy; what range of techniques including IT is used to manage performance; what measures are taken inward or outward-looking to foster innovation. Questions were generally framed so as to elicit a yes or no response and marked one or zero and then averaged to derive an index number.

For each index, the average index score was calculated for each characteristic group to derive the standard deviation across the group. That enabled us to conduct a statistical test (t-test) to see whether differences in group averages across the strata of a given characteristic were significant. The estimate of degrees of freedom is conservative and we used the two-tailed t-test so there should be no false positives.

These results find that size and age of firms are both significantly associated with the measurement of productivity and, to a slightly lesser extent, with management measures to control performance. It is mainly the oldest and largest firms who make the difference.

The questions that seem to make the most difference are those relating to the frequency of meeting of the senior management team and whether they discuss financial results and KPIs at meetings. The unsurprising conclusion is that firms that have survived longer and grown bigger seem to be those where a senior management team meets frequently and keeps an eye on quantitative measures of performance. While setting the right strategy and actively fostering innovation are no doubt important, firms' replies to questions about those things are less clearly related to outcomes than their statements about basic managerial monitoring practices.

The other significant association is between firms that export and techniques of management control. Techniques like lean production; standard costing and other benchmarking; and using IT and the cloud are not all relevant to all businesses but such state-of-the-art techniques were more likely to be used by exporting firms. We took this to show that competition raises managerial performance. Table A2 shows the significant associations we found.

On a large proprietary database of some 700 Welsh-based firms we found a statistically significant relation between size of company and profitability. Evidently, the larger a firm's revenue for a given number of workers employed the more profitable it is likely to be. The association between size and performance monitoring (control) in our small sample is, therefore, also likely to imply a relation between performance control and profitability.

Table A2: How answers differ across firm types

Firm Characteristic	Management Area				
	Measurement	Control	Strategy	Technique	Innovation
Size	**	**			
Age	**	**			
Region					
Sector					
Exporter				**	

Note: ** signifies association statistically significant with 95 per cent confidence, as indicated by two-tailed t-test

Research is continuing, tapping into the proprietary data base that contains Company House data on balance sheets for most of the firms in our survey and income statements for those with turnover above £10 million annually. Initial regression analysis looked to relate profitability explicitly to questionnaire responses but the sample of companies with turnover above £10 million was too small to yield stable results. The next stage will derive success measures from balance sheet data and look to relate these to management responses for a larger sample of companies, and will reported in the Full Report in 2020.
