Data Insight

ADR NORTHERN IRELAND

Productivity differences within Northern Ireland

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This Data Insight examines the differences in productivity across the 11 local government districts (LGDs) in Northern Ireland, using data from the Northern Ireland Annual Business Inquiry. We focus on how labour, capital, and government subsidies are associated with the gross value added (the value generated by any unit engaged in the production of goods and services) at the enterprise level.

We find there are persistent differences in productivity across LGDs, with high productivity areas driven by the presence of 'top performers'. Increasing labour inputs is found to have a positive effect on firms' gross value added across all LGDs, but the effect of increasing capital investment or government subsidies varies by LGD.

These findings suggest future policy interventions must be place-based and tailored to reflect the spatial variations present in firm performance across Northern Ireland.

Background

Northern Ireland's (NI) economy has consistently underperformed relative to the UK, with lower growth and little sign of convergence[1,3,7]. This has been a persistent feature of the post-war period through to the present day, despite significant policy interventions[2,4]. Low productivity has been identified as the central reason for this poor economic record[5]. Productivity in Northern Ireland, when measured per hour worked, is almost 20% lower than the UK average, and is the lowest of any UK region[10]. Increasing productivity has therefore been highlighted as key to raising wages and improving Northern Ireland's prosperity[8].

Previous research has focused on Northern Ireland's overall productivity level, but sub-regional differences have received relatively little attention. Disparities within Northern Ireland have previously been identified, with Belfast a productivity leader[9]. Yet we know very little about how measures of firm performance, particularly productivity and investment, vary geographically across Northern Ireland, or over time. Generous public subsidies have also been suggested as part of the explanation for Northern Ireland's underperformance, as they allow low productivity firms to survive[6], but the effect on firm performance of receiving a government subsidy has not been tested.

What we did

To understand how business performance varies across Northern Ireland, we used data from the Northern Ireland Annual Business Inquiry between 2014 and 2019. This provides financial and employment information at the reporting unit level, for surveyed enterprises located in Northern Ireland. We include enterprises defined as companies, limited liability partnerships, joint ventures, sole proprietorships, (limited) partnerships, and public corporations. Using data on more than 15,000 enterprise-year observations, we examine regional differences in labour productivity and capital expenditure, and how these measures vary across local government districts (LGDs) and industrial sectors. We then analyse the effect of employment, capital expenditure, and receipt of subsidies on the gross value added of firms in each LGD.

What we found

Descriptive statistics

Table 1 on the next page examines the mean (average) and median levels of labour productivity (output per employee), capital expenditure per employee, and government subsidies per employee, all at the enterprise level in 2019, across Northern Ireland's 11 LGDs.

The ranking of the LGDs in terms of labour productivity depended on which of these measures we used, for example:

- Belfast had the highest median level of labour productivity (£46,860) and the second highest average labour productivity (£60,340)
- The LGD with the highest average level of labour productivity was Causeway Coast and Glens (£63,210), but its median level was the lowest of any LGD (£41,270).

However, there were five LGDs where both the average and median levels of labour productivity were consistently below the NI level: Ards and North Down, Armagh City, Banbridge and Craigavon, Derry City and Strabane, Lisburn and Castlereagh, and Newry, Mourne and Down.

Low levels of investment have been identified as a cause of Northern Ireland's productivity gap[8]. Examining capital expenditure per employee at LGD level presents a mixed picture. Mid and East Antrim has the highest capital expenditure (£7,040 per employee). A further three LGDs also exceed the Northern Ireland level: Fermanagh and Omagh, Armagh City, Banbridge and Craigavon, and Antrim and Newtownabbey. The lowest capital expenditure is found in Lisburn and Castlereagh, followed closely by Belfast, and Derry City and Strabane. That Belfast, one of the highest productivity performers, has similar levels of capital expenditure to Derry City and Strabane, which is one of the lowest productivity performers, demonstrates there is not a simple relationship between capital investment and productivity. Instead, this relationship will partly reflect the existing stock of capital (which we cannot measure using the NIABI), as well as differences in sectoral composition, which we control for in our later regression analysis.

The contribution of subsidies to the underperformance of NI firms has previously been suggested[6]. In Table 1, Belfast and Causeway Coast and Glens have the highest average level of subsidies per employee, both with an average of £100 per employee. The lowest level can be found in Lisburn and Castlereagh, with an average of just £40 per employee.

Table 1: Descriptive statistics by local government district, 2019

LGD		Labour productivity		Capital expenditure per employee	Subsidies per employee
		All firms (£'000s)			
	Observations	mean	median	mean	mean
Antrim and Newtownabbey	242	58.96	47.28	4.50	0.06
Ards and North Down	154	52.58	42.25	3.87	0.05
Armagh City, Banbridge & Craigavon	352	51.13	42.67	5.55	0.05
Belfast	647	60.34	46.86	3.75	0.10
Causeway Coast and Glens	158	63.21	41.27	4.08	0.10
Derry City and Strabane	164	51.42	41.95	3.79	0.07
Fermanagh and Omagh	158	57.88	43.21	5.79	0.06
Lisburn and Castlereagh	265	54.31	42.84	3.55	0.04
Mid Ulster	367	57.17	44.10	4.34	0.06
Mid and East Antrim	141	53.78	44.69	7.04	0.09
Newry, Mourne and Down	270	56.20	41.34	4.20	0.08
Total	2,918	56.58	43.74	4.42	0.07

There has been little previous analysis of changes in labour productivity over time at LGD level. Figure 1 on the next page shows how each LGD's labour productivity has changed between 2014 and 2019, measured relative to the Northern Ireland level, which is represented by the horizontal line (NI=100). The solid line indicates all firms in each LGD, while the dashed line excludes the top 10% of firms, to show how reliant each LGD is on these top performers.

Belfast has been consistently around 10% above the NI average since 2014, although this lead has declined slightly over time. In contrast, 2019's leader for average productivity, Causeway Coast and Glens, previously lagged the NI level by 10%, with an improvement occurring only post-2017, primarily driven by the top 10% of firms in 2019. Fermanagh and Omagh also stands out as an area which saw a rapid improvement since 2014, again primarily driven by top performing firms.

In contrast, two of the lowest performing areas see a persistent gap to the NI level. Armagh City, Banbridge and Craigavon experienced the most notable decline in productivity, from around the NI level in 2014 to 10% below by 2019. Derry City and Strabane was the poorest performing LGD for productivity between 2014 and 2018, remaining around 15% to 20% below the NI level, although this gap closed in 2019 to around 10%. In both cases, there is little difference in performance when the top 10% of performers are excluded, demonstrating top performers in these areas possess similar levels of productivity to the rest of the distribution of firms. Combined with the evidence for LGDs which have seen improvements in productivity, this suggests that aggregate performance is driven by the distribution of productivity across firms at LGD level. It is particularly affected by the presence or absence of top performers.

Figure 1: Labour productivity by local government district, 2014-2019

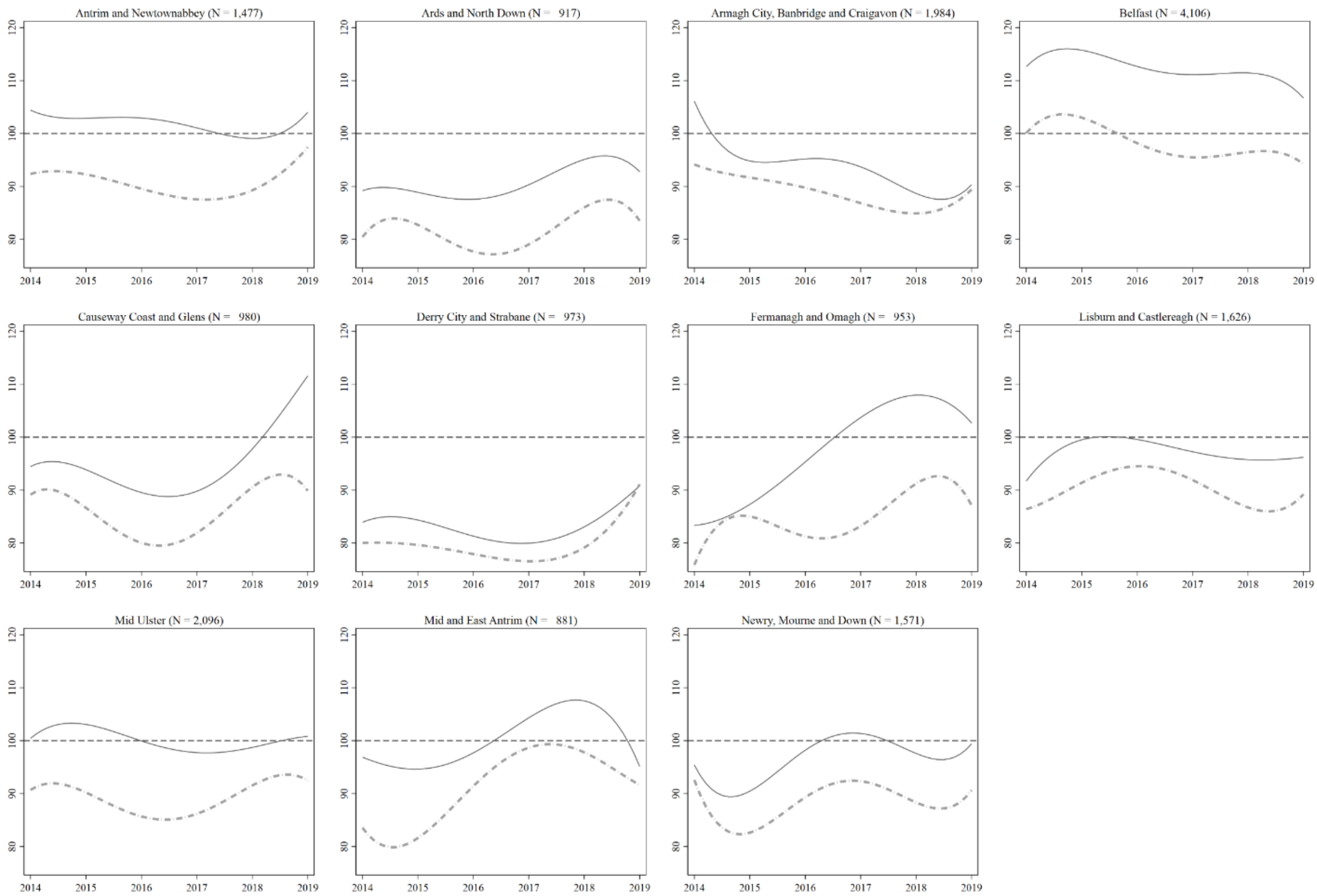
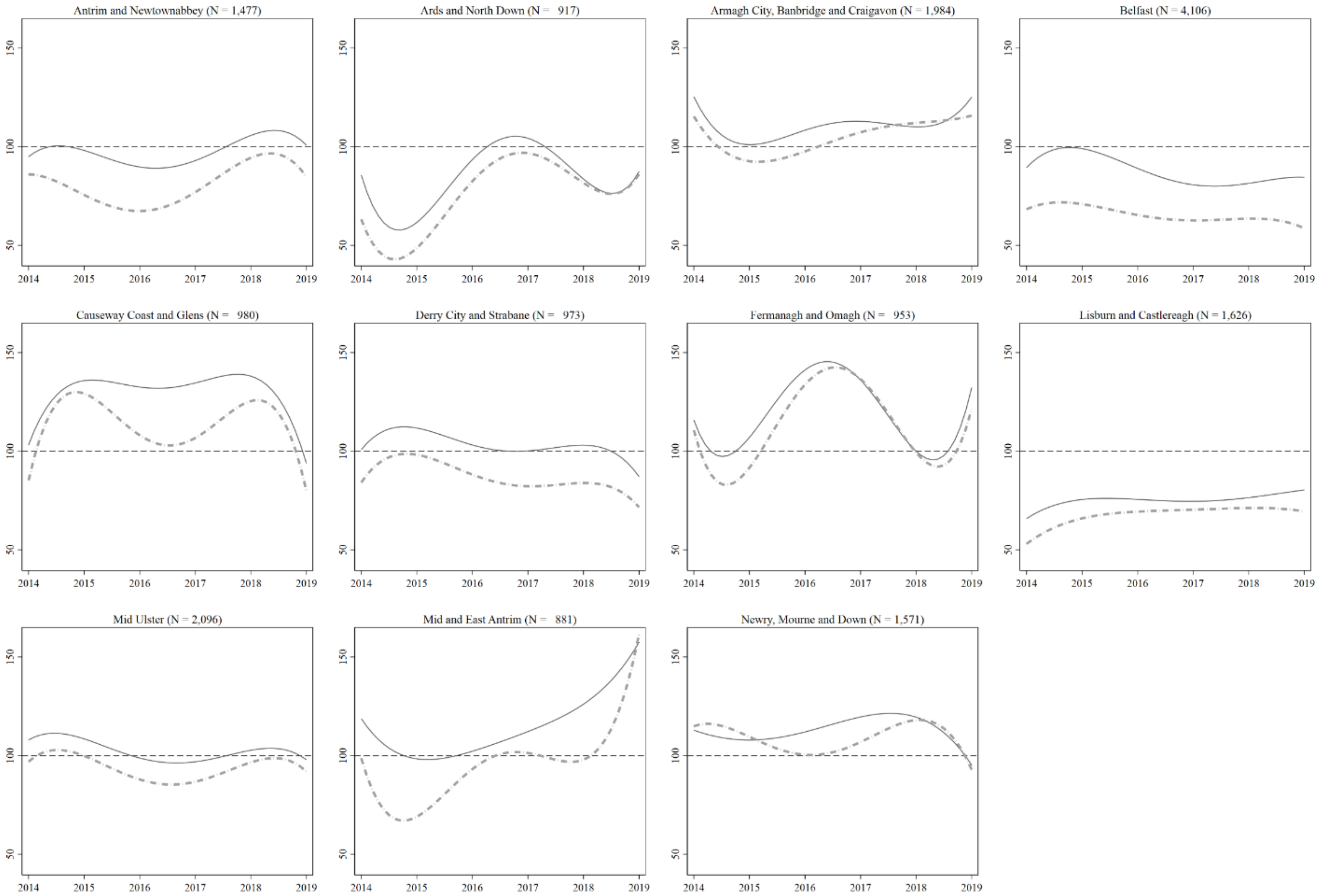


Figure 2 on the next page shows how the level of capital expenditure per employee in each LGD has changed between 2014 and 2019, relative to the Northern Ireland level (NI=100). The dark line includes all firms in each LGD, while the dashed line excludes the top 10% of firms, to show each LGD's reliance on these top performers.

Most LGDs do not see a large divergence in capital expenditure per employee when the top 10% of firms are excluded. The largest gap is for Belfast, where excluding the top 10% of firms leads to it having the lowest capital expenditure level of any LGD (around 40% below the NI level). Some LGDs display large volatility in capital expenditure, such as Fermanagh and Omagh, while Mid and East Antrim shows a substantial increase over time, from around the NI level in 2014 to over 50% above in 2019.

Figure 2: Capital expenditure per employee by LGD, 2014-2019



Notes: Values are smoothed over time.

A potential source of the spatial differences across LGDs in both productivity and capital expenditure is differing industrial structure. Table 2 examines the average levels of labour productivity, capital expenditure, and subsidies for each industry. There are large variations in both productivity and capital expenditure by sector. Productivity is highest in Utility (electricity) (£151,710) and lowest in Health (£19,620). Capital expenditure is highest in Utility (electricity) (£23,580 per employee) and lowest in Education (£250 per employee). There is also variation in the receipt of subsidies per employee, ranging from zero for several sectors, up to a maximum of £250 per employee in the Communication sector.

These sectoral variations, combined with differing industrial composition across LGDs, will contribute to the aggregate differences we see across LGDs in labour productivity, capital expenditure, and receipt of subsidies. We therefore control for these differences in our regression results.

Table 2: Average productivity, capital expenditure, and subsidies by industrial sector

Industry	Labour productivity	Capital expenditure per employee	Subsidies per employee
		All firms (£'000s)	
Administrative	43.73	3.26	0.03
Agriculture	53.33	10.33	0.13
Arts and entertainment	29.49	2.62	0.02
Communication	55.16	3.91	0.25
Construction	89.71	4.33	0.05
Education	39.86	0.25	0.58
Health	19.62	1.03	0.00
Manufacturing	47.71	4.18	0.06
Mining	85.07	14.19	0.10
Other service	33.45	1.21	0.06
Professional and scientific	60.06	1.67	0.10
Real estate	62.97	15.09	0.02
Transport	61.51	6.69	0.11
Utility (water)	63.13	8.14	0.07
Utility (electricity)	151.71	23.58	0.00
Wholesale and retail	72.99	5.44	0.04
Total	56.58	4.42	0.07

Regression results

To disentangle NI's productivity problem, we examined the extent of regional variation in firm performance at the LGD level. We used data at the enterprise level from the Northern Ireland Annual Business Enquiry over the period 2014-2019 to estimate a regression (a statistical method that attempts to determine the strength of a the relationship between one dependent variable and a series of other variables). In this case, we measured the relationship between gross value added and the total number of employees, net capital expenditure, and total subsidies received (controlling for firm, sector, region, and time fixed effects). The regression is estimated in levels and without lags.

Table 3 shows the results, with Panel A calculating the marginal effect on a firm's gross value added if we add one standard deviation of either labour (number of employees), capital (total capital expenditure), or subsidies (total value of subsidies received from government), holding other inputs constant.

All LGDs see a positive effect from increased labour, with the greatest effect being for Ards and North Down, with a 13.6% increase in gross value added, and the smallest effect being for Antrim and Newtownabbey, with an 8.14% increase. For increased capital expenditure (Capex), nearly all LGDs see a positive effect on gross value added from greater capital expenditure, with Armagh City, Banbridge and Craigavon seeing the greatest increase of 0.82%. Only Antrim and Newtownabbey sees a negative effect, where there is a 0.35% reduction in gross value added.

The final column of Panel A focuses on how total subsidies received from government are translated into gross value added. These results see the greatest variation by LGD, with six areas seeing a positive effect, and five LGDs seeing a negative effect. Of those experiencing a positive effect, this is greatest for Ards and North Down (0.52%) and Mid and East Antrim (0.46%). Of those experiencing a negative effect, this is greatest for Antrim and Newtownabbey (-0.51%) and Newry, Mourne and Down (-0.49%). These results suggest that, given the subsidies currently received by firms, there is spatial variation in the effectiveness of firms' ability to turn these subsidies into greater gross value added. This evidence suggests that for firms in some LGDs, greater receipt of subsidies is associated with the production of lower gross value added.

Table 3: Sensitivity of gross value added to inputs by LGD, 2014-2019

LGD	Labour	Capex	Subsidies	Labour	Capex	Subsidies
	Panel A			Panel B		
	Economic significance (1SD)			Relative to Belfast		
Antrim and Newtownabbey	8.14%	-0.35%	-0.51%	0.91	-1.00	-2.32
Ards and North Down	13.16%	0.55%	0.52%	1.47	1.57	6.43
Armagh City, Banbridge & Craigavon	9.43%	0.82%	-0.33%	1.05	2.31	-0.76
Belfast	8.94%	0.35%	-0.12%	1.00	1.00	1.00
Causeway Coast and Glens	11.25%	0.27%	0.17%	1.26	0.75	3.49
Derry City and Strabane	11.42%	0.49%+	0.15%+	1.28	1.40	3.28
Fermanagh and Omagh	11.26%	0.73%	-0.25%	1.26	2.06	-0.10
Lisburn and Castlereagh	9.23%	0.34%	0.23%	1.03	0.95	3.96
Mid Ulster	12.39%	0.32%+	0.09%+	1.38	0.90	2.78
Mid and East Antrim	11.76%	0.52%	0.46%	1.31	1.46	5.93
Newry, Mourne and Down	9.46%	0.45%	-0.49%	1.06	1.27	-2.14

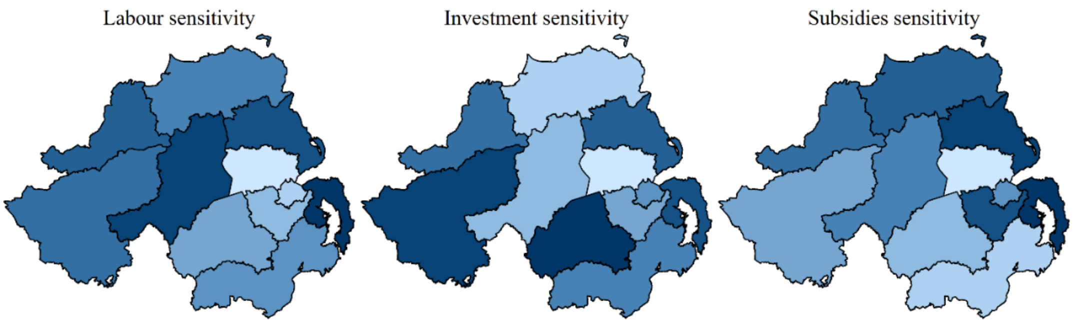
Notes: The underlying model takes into account potential unobserved firm, time, time-industry, and time-region variation. + = not statistically significant.

Given Belfast has historically been the best performing LGD within Northern Ireland, we compare the performance of each LGD to Belfast in Panel B of Table 3. The figure shown for each LGD can be interpreted as whether firms in that area are more or less effective than those in Belfast at turning additional inputs of labour, capital, or government subsidies into gross value added.

The findings show that for increased labour inputs, all LGDs see a greater return than Belfast, except for Antrim and Newtownabbey. For both increased capital and subsidy inputs, six of the ten other LGDs see a greater return relative to Belfast. This suggests there are opportunities to increase firms' gross value added outside Belfast, particularly if firms are larger. However, greater capital expenditure and government subsidies do not improve firm performance in all cases.

Finally, Figure 3 maps the regional variation in the sensitivity of gross added value to the different inputs of labour, capital, and government subsidies. While there is no consistent spatial pattern across all three maps, areas outside Belfast generally display greater sensitivity to additional inputs, particularly for labour and capital investment.

Figure 3: Regional variation in the sensitivity of gross value added to inputs, 2014-2019



Notes: The intensity of the colour is determined by the strength of the relationship estimated in Table 3. A darker shade indicates a stronger relationship, and thus a greater sensitivity of gross value added to an increase (by one standard deviation) in labour, investments or subsidies.

Why it matters

Previous research has focused on Northern Ireland's overall level of productivity, alongside the productivity of individual sectors. Our findings demonstrate the importance of considering the sub-regional variation in performance of firms, particularly when examining the relative performance of different LGDs within Northern Ireland.

Data from the Northern Ireland Annual Business Enquiry demonstrates there are persistent productivity differences between LGDs within Northern Ireland. The overall performance of each LGD is found to be related to the relative distribution between high and low performing firms: LGDs with low productivity have fewer high productivity firms, and/or relatively more low productivity firms. While Belfast is the best performing LGD within Northern Ireland, its performance is shown to be driven by these top performers.

These results are important for designing future policy interventions to improve and support firm performance across Northern Ireland. No consistent association is found between the receipt of subsidies and increased gross value added at the enterprise-level, with current subsidies having either positive or negative effects depending on location. The spatial differences in this relationship suggest that a 'one size fits all' policy approach is not appropriate when attempting to improve Northern Ireland's economic performance, and that subsidies will need to be tailored to their local contexts. This is particularly relevant when considering place-based policy, and increasing calls for the NI Executive to target business support at areas outside Belfast.

What next?

We have looked at regional differences within Northern Ireland. Further research could consider comparing LGDs in Northern Ireland with their peers in the rest of the UK, to understand whether the relationships between employment, capital expenditure, and subsidies are similar for other low productivity regions. A greater ability to link and make direct comparisons with data collected for Great Britain by the Office for National Statistics will be needed to make this possible. Our analysis could also be extended with the provision of capital stock estimates, which are currently not part of Northern Ireland Annual Business Enquiry data, but are provided by the ONS for equivalent data covering Great Britain. Their inclusion would provide an insight into firms' capital levels across Northern Ireland, and allow the calculation of total-factor productivity (a measure which accounts for the relative contributions of capital and labour to productivity), meaning the drivers of productivity could be better understood.

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