

The 9% VAT Rate: Tax Receipts and Employment

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Executive Summary

In May 2011 the Government introduced the “Jobs Initiative”, which included a number of measures to increase employment. One of these measures was the introduction from 1 July 2011 of a reduced Value Added Tax (“VAT”) rate of 9% (from 13.5%) for labour intensive services mostly linked to tourism expenditure.

This report provides an overview of Revenue data on businesses engaged in activities on which the 9% rate is charged. The analysis is undertaken to support the Department of Finance’s review of the 9% rate and therefore includes a particular focus on employment and earnings trends among businesses engaged in 9% rate activities.

Key findings of the analysis are:

- Consumer expenditure to which a VAT rate applied (i.e., excluding VAT exempt activities) was €57 billion in 2014, with the majority of this at the standard 23% VAT rate and 14 per cent of expenditure at the 9% rate.
- Hotel & similar accommodation, restaurants and non-specialised stores with food, beverages or tobacco predominating accounted for the majority of 9% activity.
- Hairdressing, holiday & other short stay accommodation, other accommodation and fitness facilities generate over 90 per cent of their sales at the 9% rate.
- It is estimated, based on current data, that to return the 9% rate to 13.5% would yield around €520 million to the Exchequer.
- From 2011 to 2016 the year on year growth in employment in 9% sectors exceeded growth compared to all other sectors. This finding holds for both businesses based in Dublin and businesses based in the rest of the country.
- While employment in the 9% sectors grew year on year from 2011, median pay fell in 2011 and again from 2013 to 2015.

With the different initiatives since 2011, particularly in tourism (e.g., “The Gathering” in 2013 or the “Wild Atlantic Way” in 2014), as well as the general and widespread changes in the economy over the same period, accurately isolating the contribution of the 9% rate alone to the outcomes noted above is challenging. An econometric analysis is undertaken to match businesses with sales at the 9% rate to comparable businesses with no 9% sales. This shows some limited evidence that employment increased in the accommodation and food sectors due to the introduction of the 9% rate.

The analysis is undertaken to support a review of the 9% rate by the Department of Finance. Any policy conclusions from the review are a matter for the Department.

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1 Introduction

In May 2011 the Government introduced the “Jobs Initiative”, which included a number of measures to increase employment. One component of the Jobs Initiative was the introduction from 1 July 2011 of a reduced Value Added Tax (“VAT”) rate of 9% for labour intensive services of which many are linked to tourism expenditure.¹ The 9% rate was intended to increase demand, driven by reduced prices, resulting in higher employment.

The services targeted to benefit from the reduced VAT rate were:²

- Supply of food and drink (excluding alcohol and soft drinks) in the course of catering or by means of a vending machine;
- Hot take-away food and hot drinks;
- Hotel lettings, including guest houses, caravan parks and camping sites;
- Admissions to cinemas, theatres, certain musical performances, museums and art gallery exhibitions;
- Amusement services of the kind normally supplied in fairground or amusement park services;
- Provision of facilities for taking part in sporting activities by a person other than a non-profit making organisation;
- Printed matter, e.g., newspapers, brochures, leaflets, programmes, maps, catalogues, printed music (excluding books); and
- Hairdressing services.

This report reviews Revenue data on businesses with activities liable for the 9% VAT rate. The analysis is undertaken to support the Department of Finance’s review of the 9% rate and therefore includes a particular focus on employment and earnings trends. Section 2 covers VAT data, Section 3 presents employment analysis and Section 4 concludes.

¹ The 9% rate was originally intended to remain in effect until December 2013 but was extended indefinitely in Budget 2014.

² Finance Act 2012 provides that admissions to historic houses, open farms and built and natural heritage facilities became activities subject to the 9% reduced rate, as of 1 January 2012.

2 VAT Trends

2.1 VAT Overview

VAT is a tax on consumer spending introduced in 1972 on Ireland's accession to the European Economic Community. VAT is the second largest source of tax receipts in the State (after Income Tax). In 2017, VAT of €13.3 billion accounted for 26 per cent of tax receipts.

As shown Figure 1, following declines during the economic downturn, VAT receipts have increased since 2012. This is driven in part by the increase in the standard rate of VAT from 1 January 2012 (21% to 23%) as well as increased consumption in the economy, with particularly strong growth of 8 per cent in both 2014 and 2017.

Figure 1: VAT Receipts



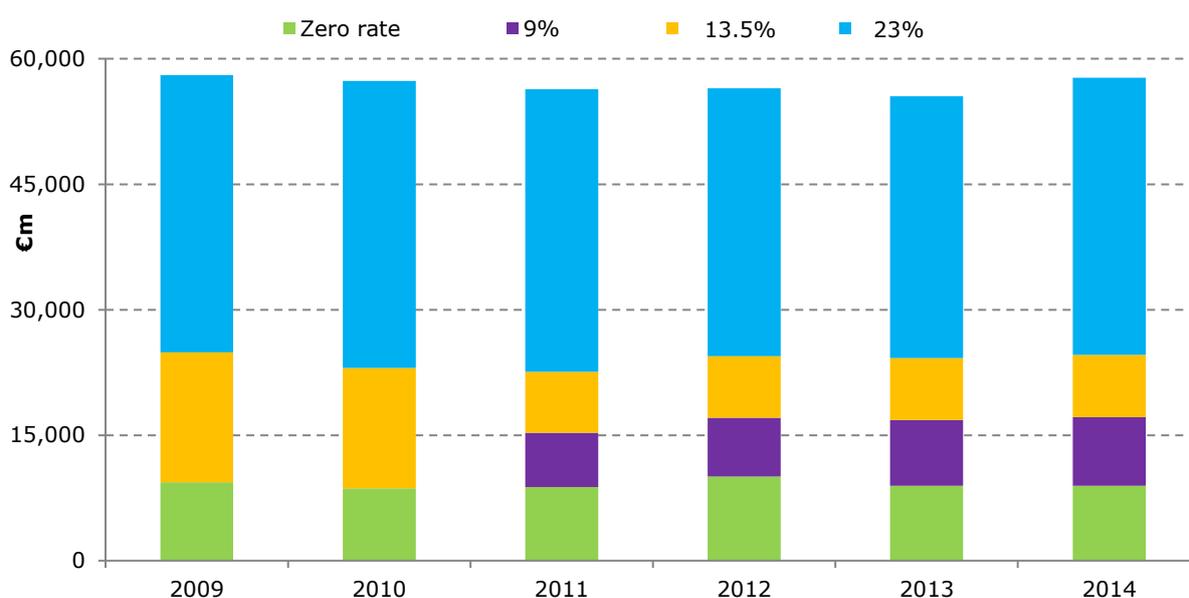
Source: Revenue analysis.

Ireland currently operates five VAT rates, a standard rate (23%), two reduced rates (13.5% and 9%), a livestock rate (4.8%) and a zero rate. In addition, a large proportion of economic activity is across VAT exempt activities such as financial services, health, education, public transport, sporting events and water supplies.

Figure 2 provides estimates of personal consumer expenditure ("PCE") at the zero, reduced and standard rates.³ The expenditure in 2014, to which a VAT rate applied, was €57 billion with the majority of expenditure at the standard rate.⁴ Expenditure at 9% accounted for 12 per cent of PCE in 2012 and 14 per cent in 2013 and 2014.

³ As noted earlier, the standard rate of VAT increased from 21% to 23% from January 2012

⁴ Note this estimate of PCE excludes expenditure on goods and services exempt from VAT, such as mortgage repayments and rent payments. The full National Accounts estimate of PCE is €89 billion in 2014.

Figure 2: Expenditure by VAT Rate

Source: Revenue analysis of CSO data.

The weighted average VAT rate ("WAR"), calculated as the effective overall VAT yield expressed as a percentage on consumption across all the VAT rates is provided in Table 1. The impact of the introduction of the 9% VAT rate is observed through the reduction in the WAR between 2011 and 2012.

Table 1: Weighted Average VAT Rate

Year	CSO WAR
2010	16.29%
2011	16.52%
2012	15.97%
2013	16.06%
2014	16.25%

Source: Revenue analysis of Revenue and CSO data.

The number of traders registered for VAT from 2009 to 2017 is provided in Table 2. The number fell year on year between 2009 and 2013 but this decline reversed from 2014 onwards. However, the number of VAT traders in 2017 remains 6 per cent lower compared to 2009.

Table 2: Registered VAT Traders

Year	Number of Traders
2009	272,506
2010	261,461
2011	250,890
2012	238,949
2013	233,669
2014	236,959
2015	240,492
2016	244,372
2017	255,541

Source: Revenue analysis.

A significant number of VAT registered traders are not actively trading. Table 3 shows the numbers of VAT registered traders who, based on regular filing of their VAT returns (the "VAT3" return), are actively trading. In 2016, four sectors (construction, wholesale & retail, professional, scientific & technical and accommodation & food) accounted for 60 per cent of active VAT traders.

Table 3: Active VAT Traders

Sector (NACE)	Year									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
	Numbers in '000s									
Construction	48.0	43.0	39.6	36.3	34.3	34.7	35.7	37.1	37.9	
Wholesale & Retail	38.8	38.8	38.3	37.6	37.0	36.7	36.5	36.5	35.8	
Professional, Sci. & Technical	25.8	25.8	25.7	25.5	25.4	26.0	26.4	27.3	27.7	
Accommodation & Food	13.9	14.0	14.2	14.2	14.3	14.4	14.7	14.7	14.6	
Manufacturing	12.1	11.7	11.5	11.2	11.2	11.4	11.7	12.1	12.2	
Agriculture	10.9	10.6	10.6	10.4	10.4	10.5	10.7	10.7	10.6	
Information & Communication	9.0	9.0	9.3	9.5	9.8	10.1	10.3	10.6	10.7	
Real Estate Activities	11.0	10.2	9.6	9.1	8.8	9.0	8.9	8.6	8.3	
Administrative & Support	8.2	8.1	8.0	7.8	7.8	8.0	8.2	8.5	8.7	
Transportation & Storage	8.4	8.1	7.8	7.5	7.4	7.4	7.4	7.5	7.4	
Other Service Activities	6.3	6.3	6.2	6.1	6.0	6.2	6.3	6.5	6.7	
Arts, Entertainment	3.1	3.1	3.1	3.1	3.1	3.1	3.3	3.3	3.4	
Financial & Insurance	2.1	2.2	2.3	2.5	2.6	2.8	3.0	3.1	3.3	
Other	14.7	11.4	9.1	8.0	7.3	6.7	6.2	5.7	5.6	
All Sectors	212.1	202.3	195.3	188.9	185.5	187.0	189.2	192.3	192.8	

Source: Revenue analysis.

2.2 Identification of 9% Activity

VAT registered businesses file regular VAT3 returns and either pay to Revenue the net amount of VAT collected or, where the VAT incurred on operational input costs exceeds the value of VAT collected on sales, are due a VAT repayment. The VAT3 is designed to be

relatively simple in order to minimise the administrative burden on businesses. As such there is no requirement for a business to provide details on the nature of products or activities sold, the sales by VAT rate or the type of customer who made the purchase.

In addition to the VAT3 return, VAT registered businesses are required to submit an annual Return of Trading Details ("RTD"). The RTD is a statistical return which provides a breakdown by VAT rate of the businesses' sales and purchases. The RTD has the potential to identify VAT registered traders supplying at the 9% VAT rate. However, while measures have been taken in recent years by Revenue to improve the compliance rate of traders completing and filing RTDs, for the years examined in this report the RTD returns are not filed by the full population of traders.

The RTD alone is therefore not sufficient to allow a complete analysis of 9% activity and a mixed approach is taken. The analysis in this report identifies traders as 9% or non-9% according to their sector (based on NACE code on Revenue's records) and the prevalence of RTD returns indicating 9% activity within a sector.⁵

Analysis of information from RTDs indicates that a large number of businesses in multiple sectors supply at the 9% rate in 2016.⁶ The 20 sectors in Table 4 account for the majority (83 per cent) of businesses that indicate supplies at the 9% VAT rate on RTDs. The remaining 17 per cent are distributed across a further 220 NACE codes. Also shown are the shares of sales at 9% for each sector. Hotel & similar accommodation, restaurants and retail sales in non-specialised stores account for the majority of 9% activity. However these sectors are comparatively less dependent on the 9% rate. Four sectors (hairdressing, holiday & other short stay accommodation, other accommodation and fitness facilities) generate over 90 per cent of their sales at the 9% rate.

⁵ A NACE code is a European classification code that identifies over six hundred different business activities. On registration with Revenue, a business is assigned to a NACE sector based on its business description. While NACE codes on Revenue records may be incorrect or out of date on some individual case records, they are considered sufficiently accurate to support broad analysis.

⁶ It is important to note that while a business may have activities in multiple sectors, it is assigned one NACE code on Revenue records, usually based on the primary or largest activity undertaken in that business.

Table 4: Sectors Supplying 9% Services

NACE Code	Sector Description	Sector's share of 9% activity	Share of sales at 9% in sector
5510	Hotels & similar accommodation	40%	76%
5610	Restaurants & mobile food service activities	26%	88%
4711	Retail sale in non-specialised stores with food, beverages or tobacco predominating	17%	16%
5630	Beverage serving activities	<1%	31%
9602	Hairdressing & other beauty treatment	<4%	96%
5621	Event catering activities	<3%	75%
9311	Operation of sports facilities	<3%	71%
5813	Publishing of newspapers	<3%	61%
5520	Holiday & other short-stay accommodation	<2%	94%
5914	Motion picture projection activities	<1%	69%
5590	Other accommodation	<1%	96%
5530	Camping grounds, recreational vehicle parks & trailer parks	<1%	88%
9313	Fitness facilities	<1%	91%
9321	Activities of amusement parks & theme parks	<1%	74%
5819	Other publishing activities	<1%	58%
0143	Raising of horses & other equines	<1%	79%
5811	Printing of newspapers	<1%	56%
5814	Publishing of journals & periodicals	<1%	51%
9102	Museums activities	<1%	55%
9103	Operation of historical sites & buildings & similar visitor attractions	<1%	59%
All Sector		100%	

Source: Revenue analysis. Note: data related to 2016.

2.3 9% Sectors

Based on the analysis above, 10 sectors are selected as “9% sectors” for analysis of the 9% rate in the remainder of this report. The 10 sectors are shown in Table 5.⁷

Table 5 provides the number of traders in each 9% sector and the year on year growth in the number of VAT traders between 2009 and 2017. Food, sport and the raising of equines experienced year on year growth in the five years following 2011 (the introduction of the 9% VAT rate). Hairdressing did not experience growth in the number of VAT registered traders until 2014 while VAT trader numbers in accommodation declined in 2011 and again in 2012. The number of VAT traders in the motion picture sector swings between growth and decline across all years.

⁷ Some 9% sectors are aggregated from multiple NACE codes. Food includes restaurants (5610) and event catering (5621). Accommodation includes hotels (5510), holiday & short term accommodation (5520), other accommodation (5590) and camping grounds (5530). Sport includes operation of sports facilities (9311) and fitness facilities (9313). Publishing includes the publishing and printing of newspapers, journals & periodicals and other publishing activities (5813, 5819, 5811 and 5814). See <https://www.cso.ie/px/u/NACECoder/NACEItems/searchnace.asp> for fuller descriptions of NACE codes.

It should be noted that the 9% rate introduction was only one of many factors affecting trader numbers in this period. For example, the change in consumer preferences moving towards online or electronic newspapers and books likely underlies the decline experienced in VAT trader numbers across all years in the publishing sector.

Table 5: 9% Sectors – Numbers of Traders

Sector	2010	2011	2012	2013	2014	2015	2016	2017
	Number of Traders							
Food	5,950	6,185	6,304	6,447	6,628	6,824	6,991	7,036
Hairdressing & beauty	3,442	3,434	3,391	3,370	3,466	3,612	3,757	3,881
Accommodation	2,066	1,989	1,941	1,983	2,019	2,070	2,082	2,069
Sport	919	898	925	976	996	1,029	1,051	1,044
Publishing	308	300	284	278	264	248	238	227
Amusement parks	67	71	71	64	65	66	71	67
Motion picture projection	66	69	65	65	61	62	61	59
Raising of equines	45	50	54	65	75	84	99	108
Museums activities	42	42	45	41	45	44	45	42
Operation of historical sites	32	32	37	36	36	37	39	41
All 9% Sectors	12,937	13,070	13,117	13,325	13,655	14,076	14,434	14,574
	Growth in Number of Traders							
Food	5%	4%	2%	2%	3%	3%	2%	1%
Hairdressing & beauty	0%	0%	-1%	-1%	3%	4%	4%	3%
Accommodation	-4%	-4%	-2%	2%	2%	3%	1%	-1%
Sport	1%	-2%	3%	6%	2%	3%	2%	-1%
Publishing	-9%	-3%	-5%	-2%	-5%	-6%	-4%	-5%
Amusement parks	-4%	6%	0%	-10%	2%	2%	8%	-6%
Motion picture projection	3%	5%	-6%	0%	-6%	2%	-2%	-3%
Raising of equines	-6%	11%	8%	20%	15%	12%	18%	9%
Museums activities	-2%	0%	7%	-9%	10%	-2%	2%	-7%
Operation of historical sites	-3%	0%	16%	-3%	0%	3%	5%	5%
All 9% Sectors	1%	1%	0%	2%	2%	3%	3%	1%

Source: Revenue analysis.

Table 6 shows net VAT receipts (from all VAT rates) and the year on year change in VAT receipts in 9% sectors. All sectors experienced a reduction in VAT receipts in 2012, as would be expected given the reduction in the 9% rate by a third (from 13.5% to 9%). It would require a very significant increase in activity (sales) to counter such a reduction in the space of year.

The food sector experienced year on year growth in VAT receipts from 2013. VAT receipts in the accommodation sector declined in all years except 2015.⁸

⁸ VAT receipts for the raising of equines were also impacted by the introduction of the reduced VAT rate being a VAT increase for this sector (previously 4.8%).

Table 6: 9% Sectors – VAT Receipts

Sector	2010	2011	2012	2013	2014	2015	2016	2017
	VAT Receipts €m							
Food	241	205.1	160.6	161.4	165	178.7	198.2	209.3
Hairdressing & beauty	42.3	36.4	29.8	28.4	28.1	29.8	33.2	36.1
Accommodation	207.9	176.7	156.3	147	144.1	169.4	168.2	162.4
Sport	16.9	21.8	15.9	18.3	15.7	14.8	18.6	17.6
Publishing	43.4	35.1	29.6	32.4	32.5	31.8	31.1	29.3
Amusement parks	2.2	3.1	2.3	2.5	1.9	1.9	2.5	2.7
Motion picture projection	11.1	8.3	4.4	5.2	5.4	5.2	5.4	6.9
Raising of equines	-0.1	0	-0.5	-0.3	0.2	-0.7	-0.9	-2.9
Museums activities	0.6	0.5	-0.5	0.2	0.5	1.2	1.1	1.7
Operation of historical sites	0.0	0.30	0.2	0.1	0.1	-0.2	-0.4	0
All 9% Sectors	565	487	398	395	394	432	457	463.1
Growth in VAT Receipts								
Food	-4%	-15%	-22%	0%	2%	8%	11%	6%
Hairdressing & beauty	-6%	-14%	-18%	-5%	-1%	6%	11%	9%
Accommodation	-1%	-15%	-12%	-6%	-2%	18%	-1%	-3%
Sport	839%	29%	-27%	15%	-14%	-6%	26%	-5%
Publishing	-12%	-19%	-16%	9%	0%	-2%	-2%	-6%
Amusement parks	-46%	41%	-26%	9%	-24%	0%	32%	8%
Motion picture projection	-1%	-25%	-47%	18%	4%	-4%	4%	28%
Raising of equines	-86%*	-100%	0%*	40%*	167%	-450%*	-29%*	-222%*
Museums activities	-57%	0%	-200%*	-140%	150%	140%	-8%	55%
Operation of historical sites	-	-	0%	-50%	0%	-300%*	-100%*	100%
All 9% Sectors	-2%	-14%	-18%	-1%	0%	10%	6%	1%

Source: Revenue analysis. Note: * denotes sector in a net VAT repayment position.

Table 7 shows VATable output across each of these sectors. In contrast to the fall in VAT receipts from the accommodation sector in 2013 and 2014, output increased which may indicate that additional investment occurred across this period and also accounts for the increase in the cost of purchases as the standard rate of VAT increased by 9.5 per cent (from 21% to 23%).

Table 7: 9% Sectors – VATable Output

Sector	2010	2011	2012	2013	2014	2015	2016	2017
	VATable Output €m							
Food	398.2	355.3	319.6	333.1	341.4	369.6	411.4	437.7
Hairdressing & beauty	67.2	60.9	55.6	54.2	54.3	58.2	64.7	72.1
Accommodation	360	328	319.7	324.7	347.6	391.7	422.9	450.9
Sport	66.7	60.1	59	60.1	46.6	51.5	56.9	56.2
Publishing	68.7	57.7	48.5	53.9	53.1	53	53	49.2
Amusement parks	5.1	5.4	4.5	4.6	4.8	6.2	6.7	6.3
Motion picture projection	28	25.3	24.3	22.4	21.5	36.1	27.7	28.4
Raising of equines	3.2	3.5	3.2	3.4	4.2	5.4	5.1	7
Museums activities	1.6	1.5	1.7	2	2.5	4.1	4.6	5.4
Operation of historical sites	0.8	1.1	1.2	1	1	1.2	1.5	1.6
All 9% Sectors	1,000	899	837	859	877	977	1,055	1,115
Sector	Growth in VATable Output							
	2010	2011	2012	2013	2014	2015	2016	2017
Food	-4%	-11%	-10%	4%	2%	8%	11%	6%
Hairdressing & beauty	-9%	-9%	-9%	-3%	0%	7%	11%	11%
Accommodation	-9%	-9%	-3%	2%	7%	13%	8%	7%
Sport	11%	-10%	-2%	2%	-22%	11%	10%	-1%
Publishing	-14%	-16%	-16%	11%	-1%	0%	0%	-7%
Amusement parks	-18%	6%	-17%	2%	4%	29%	8%	-6%
Motion picture projection	0%	-10%	-4%	-8%	-4%	68%	-23%	3%
Raising of equines	7%	9%	-9%	6%	24%	29%	-6%	37%
Museums activities	-24%	-6%	13%	18%	25%	64%	12%	17%
Operation of historical sites	0%	38%	9%	-17%	0%	20%	25%	7%
All 9% Sectors	-6%	-10%	-7%	3%	2%	11%	8%	6%

Source: Revenue analysis

2.4 Exchequer Cost of the 9% Rate

It is not possible to directly estimate the cost to the Exchequer of the 9% VAT rate using the information supplied on tax returns alone. Based on a combination of data from Revenue, CSO and other sources, the *Ready Reckoner* provides Revenue's overall estimate of changing the 9% rate.⁹ It is estimated, based on current data, that to return the 9% rate to 13.5% would yield around €520 million to the Exchequer.

An alternative approach, based on the analysis of sectors in Sections 2.2 and 2.3 is to estimate the VAT revenue foregone across the main sectors identified as providing these activities.¹⁰ This calculation is performed for each of the sectors identified in Table 5. Based on this estimate, the cost of the 9% rate increased yearly between 2012 and 2016.

⁹ The Revenue *Ready Reckoner* is available at: <https://www.revenue.ie/en/corporate/information-about-revenue/statistics/ready-reckoner/index.aspx>.

¹⁰ For example: food on average has 88% of activity (Proportion "P_{9%}") at the 9% rate and assuming the remaining 12% of sales are at 23%, the VAT attributed to 9% sales is calculated as follows:
 (VAT on Sales) * (P_{9%} * 9% / sum(P_{9%} * 9% + (1 - P_{9%}) * 23%)) / 9 * (13.5 - 9)

Table 8: Estimation of VAT Forgone in “9% Sectors” Only

Activity	Average Activity at 9%	2012	2013	2014	2015	2016
Food	88%	118.5	123.5	126.6	137.0	152.5
Hairdressing & beauty	96%	25.1	24.5	24.5	26.3	29.2
Accommodation	76%	88.5	89.8	96.2	108.4	117.0
Sport	90%	23.0	23.4	18.1	20.1	22.2
Publishing	56%	8.1	9.0	8.8	8.8	8.8
Amusement parks	74%	1.2	1.2	1.3	1.6	1.8
Motion picture projection	70%	5.8	5.3	5.1	8.6	6.6
Raising of equines	79%				4.1	3.9
Museums activities	55%	0.3	0.3	0.4	0.7	0.7
Operation of historical sites	59%	0.4	0.4	0.4	0.4	0.5
Exchequer Cost of the 9% Rate (€m)		270.4	277.1	281.1	311.5	338.9

Source: Revenue analysis.

The figures in Table 8 differ from those in the Ready Reckoner. However, given the value of 9% products provided by businesses not included within the “9% sectors” analysed in this report, as well as other factors not included here (for example, intermediate consumption), this difference is to be expected.

3 Employment Trends

Revenue data from employers returns (the "P35" return) are linked to VAT records to analyse the employment of businesses in the 9% sectors (as defined in Section 2).¹¹ It should be noted that Revenue data record employments rather than individual employees (e.g., someone switching jobs during a year or holding two jobs concurrently would be recorded as two separate employments).¹² While Revenue employment data are useful to compare performance in 9% and non-9% sectors, they should not be expected to equate to CSO labour force figures for these sectors.

3.1 Employment and Earnings in 9% Sectors

Table 9 shows employment in the 9% sectors over recent years, as well as year on year growth rates in employment.

Table 9: 9% Sectors – Employments

Sector	2010	2011	2012	2013	2014	2015	2016
Number of Employments							
Food	81,966	86,177	92,147	98,528	106,394	115,344	126,626
Hairdressing & beauty	14,645	14,903	15,398	15,845	17,157	18,237	19,994
Accommodation	66,561	68,348	70,310	73,295	81,246	86,060	90,664
Sport	15,019	15,535	14,770	15,297	14,416	15,796	16,727
Publishing	3,545	3,205	3,037	3,501	3,434	3,085	3,115
Amusement parks	851	1,048	1,147	1,159	1,282	1,481	1,555
Motion picture projection	2,277	2,154	1,934	1,772	1,790	1,854	1,893
Raising of equines	708	718	725	754	777	840	909
Museums activities	959	907	954	966	1,081	1,095	1,108
Operation of historical sites	295	413	580	627	661	752	829
All 9% Sectors	186,826	193,408	201,002	211,744	228,238	244,544	263,420
Growth in Number of Employments							
Food	1%	5%	7%	7%	8%	8%	10%
Hairdressing & beauty	-3%	2%	3%	3%	8%	6%	10%
Accommodation	-4%	3%	3%	4%	11%	6%	5%
Sport	6%	3%	-5%	4%	-6%	10%	6%
Publishing	-20%	-10%	-5%	15%	-2%	-10%	1%
Amusement parks	-11%	23%	9%	1%	11%	16%	5%
Motion picture projection	-5%	-5%	-10%	-8%	1%	4%	2%
Raising of equines	-4%	1%	1%	4%	3%	8%	8%
Museums activities	-1%	-5%	5%	1%	12%	1%	1%
Operation of historical sites	5%	40%	40%	8%	5%	14%	10%
All 9% Sectors	-1%	4%	4%	5%	8%	7%	8%

Source: Revenue analysis.

¹¹ The most recent year for which P35 data are available is 2016.

¹² Revenue employments also include those in receipt in occupational pensions, these are filtered out here based on their PRSI class.

In 2016 the number of employments in the accommodation sector was 32 per cent higher than in 2011 while numbers in the food sector increased by 41 per cent. Both sectors experienced year on year growth in employment between 2012 and 2016. The change in employment numbers in other 9% sectors varies. Employment in publishing/printing declined significantly in 2015.

While employment in the 9% sectors grew year on year from 2011, median pay fell in 2011 and again from 2013 to 2015. Table 10 shows the level and change in median employee earnings. The rate of increase in employee earnings from 2012 in both accommodation and food is below the rate of increase of employee numbers (Table 9). Employment numbers increased yet the value of these new employments, in salary terms, was lower than pre-existing (2011) employment in these sectors. The median pay per employee in accommodation and food fell between 2011 and 2016.

Table 10: 9% Sectors – Earnings

Sector	2010	2011	2012	2013	2014	2015	2016
Median Earnings €							
Food	6,420	6,113	6,058	5,897	5,406	5,349	5,341
Hairdressing & beauty	8,904	8,394	8,096	8,125	7,819	8,566	8,921
Accommodation	7,798	7,761	7,882	7,678	6,843	6,823	6,907
Sport	6,749	6,003	7,462	6,956	6,560	5,985	5,950
Publishing	29,727	29,669	28,861	24,446	25,057	27,838	29,439
Amusement parks	3,633	4,191	3,719	3,729	3,227	3,777	4,181
Motion picture projection	7,774	6,729	6,348	7,647	6,818	6,818	7,061
Raising of equines	32,129	31,512	31,928	30,088	30,069	27,924	26,264
Museums activities	20,137	21,370	18,977	17,627	12,034	13,835	14,524
Operation of historical sites	8,940	8,112	6,689	6,191	6,540	6,310	6,739
All 9% Sectors	7,467	7,128	7,156	6,956	6,331	6,300	6,361
Growth in Median Earnings							
Food	-7%	-5%	-1%	-3%	-8%	-1%	0%
Hairdressing & beauty	-9%	-6%	-4%	0%	-4%	10%	4%
Accommodation	-3%	0%	2%	-3%	-11%	0%	1%
Sport	-15%	-11%	24%	-7%	-6%	-9%	-1%
Publishing	-4%	0%	-3%	-15%	2%	11%	6%
Amusement parks	14%	15%	-11%	0%	-13%	17%	11%
Motion picture projection	-4%	-13%	-6%	20%	-11%	0%	4%
Raising of equines	3%	-2%	1%	-6%	0%	-7%	-6%
Museums activities	-10%	6%	-11%	-7%	-32%	15%	5%
Operation of historical sites	12%	-9%	-18%	-7%	6%	-4%	7%
All 9% Sectors	-6%	-5%	0%	-3%	-9%	0%	1%

Source: Revenue analysis.

The earning distribution across employee pay also varies across these sectors as shown in Table 11. Revenue data do not distinguish between part time and full time employment. However, it would be expected that part time employment is common in many 9% sectors and this likely explains the distribution of earnings in the lower ranges shown in the Table. In wholesale & retail the bottom 80 per cent of earners receive around 40 per cent of total salary costs, while accommodation typically spends around 55 per cent of salary on the lower paid 80 per cent of employees. In hairdressing, which would typically have a higher level of training required, this rises to 60 per cent of the total salary costs.

Table 11: Salary Distribution of 9% Sector Employments

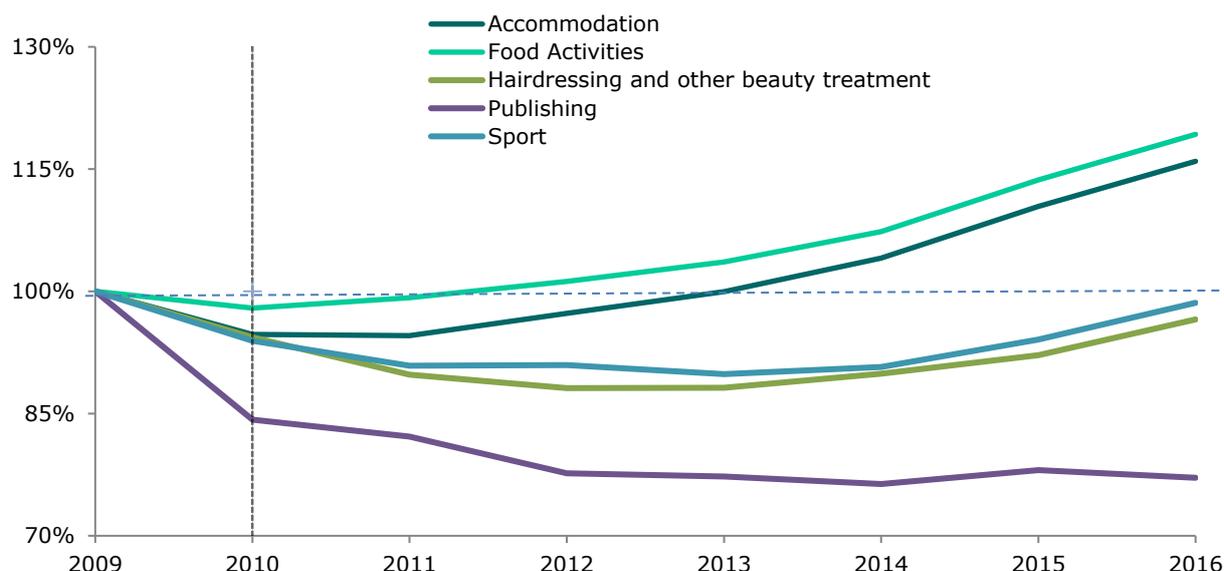
Earning Band:	<€3k	€3k-€10k	€10k-€21k	€21k-€36k	>€36k
Year	Proportion of Employments in Each Earnings Band				
2009	16%	33%	32%	15%	5%
2010	17%	34%	31%	14%	4%
2011	13%	36%	32%	14%	4%
2012	9%	39%	34%	14%	4%
2013	10%	39%	33%	13%	4%
2014	19%	37%	30%	12%	3%
2015	19%	36%	29%	12%	3%
2016	19%	36%	29%	13%	4%

Source: Revenue analysis.

To further assess changes in employment and salary costs in 9% sectors, a sample of businesses trading in each 9% sector from 2009 to 2016 was analysed. Setting 2009 as a base year for total salary costs and employee numbers, accommodation and restaurants experienced growth in salary costs from 2010 onwards as indicated in Figure 3. By 2016 hairdressing and sport were still just below the salary bill paid in 2009 while in 2016 the food and accommodation sectors were paying a salary bill 18 per cent higher than 2009.

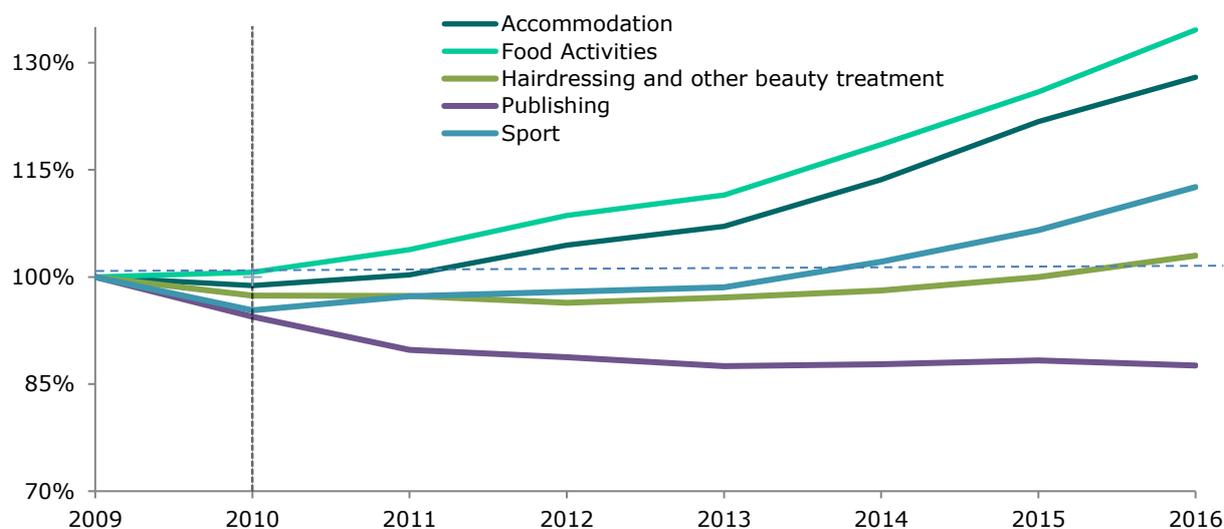
In terms of the change in staff numbers (Figure 4), the rate of increase in numbers of employments is faster than salary cost. In 2016, with the exception of the publishing sector, all other 9% sectors have employed a higher number of staff. The accommodation and food sectors combined have 30 per cent higher employment rate in 2016 (than in 2009) while the cost of this labour is close to 17 per cent higher.

Figure 3: Change in Salary Costs



Source: Revenue analysis. Note: Base 2009=100.

Figure 4: Change in Staff Numbers



Source: Revenue analysis. Note: Base 2009=100.

Table 12 provides the proportion of businesses that increased or decreased their salary costs and staff numbers relative to 2009. Even pre the 9% rate introduction, within accommodation and food, the number of businesses that reduced staff numbers in 2010 (52 per cent and 54 per cent respectively) compared to 2009 is less than those of other 9% sectors (around 60 per cent or more have salary decreases in most other 9% sectors).

Accommodation experienced the highest share of businesses with increased salary costs between 2011 and 2013. The hairdressing sector did not recover in terms of the number of businesses increasing salary costs until 2014, the sport sector recovered a year later.

Table 12: Share of Businesses Changing Salary Costs & Staff Numbers Compared to 2009

	2010	2011	2012	2013	2014	2015	2016
Accommodation							
Decreased Salary	68.4%	63.5%	57.0%	48.6%	42.6%	33.8%	29.5%
Increase Salary	31.6%	36.5%	43.0%	51.4%	57.4%	66.2%	70.5%
Reduced Staff	52%	49%	35%	33%	22%	20%	12%
Increased Staff	48%	51%	65%	67%	78%	80%	88%
Food Activities							
Decreased Salary	59.2%	60.9%	56.8%	54.9%	50.4%	47.1%	42.8%
Increase Salary	40.8%	39.1%	43.2%	45.1%	49.6%	52.9%	57.2%
Reduced Staff	54%	45%	38%	31%	29%	21%	19%
Increased Staff	46%	55%	62%	69%	71%	79%	81%
Hairdressing							
Decreased Salary	64.9%	67.6%	65.3%	66.0%	62.8%	60.6%	56.9%
Increase Salary	35.1%	32.4%	34.7%	34.0%	37.2%	39.4%	43.1%
Reduced Staff	68%	67%	65%	60%	54%	50%	47%
Increased Staff	32%	33%	35%	40%	46%	50%	53%
Publishing							
Decreased Salary	70.6%	72.1%	70.6%	75.0%	72.1%	69.1%	73.5%
Increase Salary	29.4%	27.9%	29.4%	25.0%	27.9%	30.9%	26.5%
Reduced Staff	79%	90%	89%	89%	82%	81%	81%
Increased Staff	21%	10%	11%	11%	18%	19%	19%
Sport							
Decreased Salary	69.0%	70.0%	73.5%	71.5%	72.0%	66.0%	62.0%
Increase Salary	31.0%	30.0%	26.5%	28.5%	28.0%	34.0%	38.0%
Reduced Staff	66%	55%	59%	56%	45%	42%	39%
Increased Staff	34%	45%	41%	44%	55%	58%	61%
All 9% Sectors							
Decreased Salary	63%	64%	61%	59%	55%	51%	47%
Increase Salary	37%	36%	39%	41%	45%	49%	53%
Reduced Staff	67%	62%	59%	56%	52%	49%	45%
Increased Staff	33%	38%	41%	44%	48%	51%	55%

Source: Revenue analysis.

3.2 Relative Employment Growth in 9% Sectors

Table 13 shows the percentage year on year change in employment in the 9% sectors compared to all other sectors (excluding 9%). Both 9% sectors and all other sectors experience a decline in employment numbers in 2010. From 2011 to 2016 the year on

year growth in employment units in the 9% sectors exceeded growth compared to all other sectors (which is confirmed by CSO Labour Force Survey data). At aggregate level, earnings growth in the 9% sectors was faster in most years since 2011, compared to non-9% sectors, but median earnings growth was lower.

Table 13: Year on Year Growth in Employment Numbers and Earnings

Year	9% Sectors			All other Sectors (Excluding 9%)		
	Number of Employments	Earnings	Median Earnings	Number of Employments	Earnings	Median Earnings
2010	-1%	-4%	-6%	-5%	-4%	0%
2011	2%	-2%	-5%	-2%	-6%	-7%
2012	4%	2%	0%	0%	0%	-1%
2013	5%	3%	-3%	2%	2%	0%
2014	5%	4%	-9%	4%	5%	-2%
2015	8%	8%	0%	4%	6%	0%
2016	7%	9%	1%	5%	7%	1%

Source: Revenue analysis.

3.3 Relative Employment Growth in 9% Sectors by Location

Using information on the primary location of each registered business, Table 14 shows the year on year change in employment numbers and earnings for 9% and non-9% sectors by location (Dublin and rest of the country). For the 9% sector, employment in both Dublin and non-Dublin locations grew faster than employment in all other sectors, with year on year growth evident from 2011. Employment growth among 9% sectors was faster in Dublin than non-Dublin locations. Median pay for Dublin based 9% sectors fell year on year with the exception of 2015, the same is observed for non-Dublin based 9% sectors with the exception of 2016.

Table 14: Year on Year Growth in Employment Numbers and Earnings by Location

Year	9% Sectors			All other Sectors (Excluding 9%)		
	Number of Employments	Earnings	Median Earnings	Number of Employments	Earnings	Median Earnings
Dublin based businesses						
2011	3%	1%	-6%	0%	0%	-3%
2012	5%	3%	-3%	0%	2%	1%
2013	7%	5%	-1%	2%	2%	-2%
2014	5%	5%	-3%	5%	6%	-2%
2015	8%	10%	3%	7%	8%	-4%
2016	8%	8%	-4%	6%	8%	0%
Non-Dublin based businesses						
2011	2%	-2%	-7%	-1%	-2%	-5%
2012	3%	2%	-2%	0%	-1%	0%
2013	4%	2%	-4%	2%	3%	1%
2014	6%	4%	-5%	4%	4%	-3%
2015	8%	10%	-2%	5%	7%	1%
2016	7%	9%	3%	5%	7%	0%

Source: Revenue analysis.

3.4 Matching

The above analysis assesses trends before and after the introduction of the 9% rate. This provides indications of correlation but the ability to establish causation is limited.

An alternative approach is to use econometric matching techniques that compare similar businesses over time, where the only difference is one business availed of the 9% rate and the other did not.¹³ Any difference between these matched businesses with respect to employment numbers or total salary costs is therefore likely due to the 9% rate.

The 9% sectors that contain the greatest number of businesses with substantial activity taxed at the 9% rate are the accommodation and food sectors. Businesses in these sectors, as defined in Section 2.3, are selected as the treatment group. For the control, against which to compare the treatment group, previous studies have attempted to compare the accommodation and food sectors against the rest of the economy. The difficulty with this approach is that the aggregate economy might have been affected by different economic shocks compared to the accommodation and food sectors. Therefore,

¹³ Precisely, matched Difference-in-Difference methods are estimated, as documented in detail in the Appendix.

the whole economy may not make a suitable comparison. Instead, this analysis matches individual accommodation and food businesses that trade at the 9% rate to similar individual businesses operating in retail that did not.¹⁴ The retail sector (excluding food, beverages and tobacco) is considered comparable to accommodation and food services as these sectors are all largely driven by discretionary consumer expenditure.¹⁵

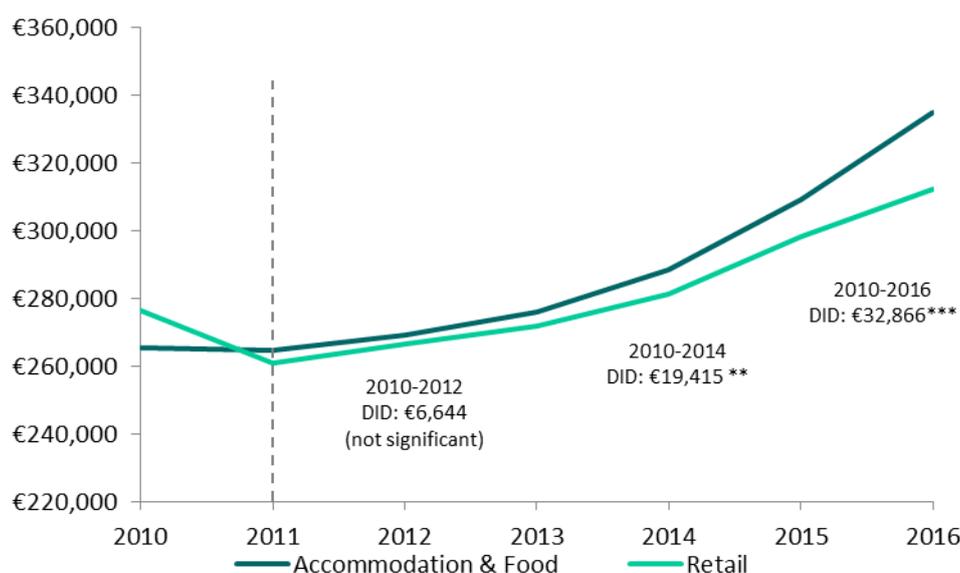
Figure 5 shows the average total annual salary costs per business for both accommodation and food and the retail sector over time. Also included are econometrically estimated Difference in Difference (DID) estimates. These show the average difference in total salary costs over time for each 9% business compared to a similar business in the retail sector.

Overall, the total salary bill increases in both sectors over time. However, when comparing these sectors econometrically, there is no significant evidence that accommodation and food services increased their total salary bills in the years immediately following the introduction of the 9% rate over and above a similar cohort of businesses in the retail sector that did not receive the lower rate. In other words, the short term difference (2010 to 2012) may arise due to chance rather than a systematic difference between 9% rated businesses and other businesses.

As businesses' average total salary costs increase faster in accommodation and food services compared to retail after 2013, the difference becomes statistically significant. Between 2010 and 2014, a business with sales at the 9% rate will on average have salary costs that are over €19,000 higher over and above similar businesses in the retail sector that did not have sales at the lower rate. However, as more time elapses following the introduction of the 9% rate in 2011, there is a greater chance that the difference is not being caused by the reduced VAT rate but rather being driven by other factors in a faster growing economy.

¹⁴ Nonetheless, the results were similar when businesses in food and accommodation were matched to businesses in the whole economy.

¹⁵ The control identified as the cohort of businesses in the retail sector that do not have significant trade at the 9% rate. Specifically, the retail sales that are considered are from NACE codes 4741 to 4799. Retail sales that are not considered are in non-specialised stores (NACE codes 4711 and 4719), of food, beverages and tobacco in specialised stores (NACE codes between 4721 and 4729) and of automotive fuel (NACE code 4730).

Figure 5: Matching Analysis of Average Total Salary Costs

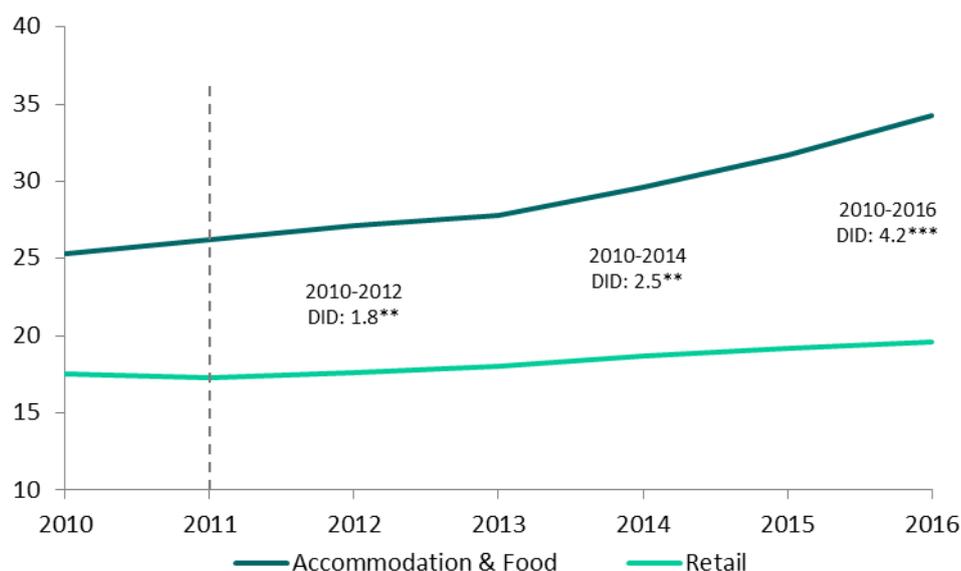
Source: Revenue analysis. Notes: * Indicates results are statistically significant at the 90% level, ** significant at the 95% level and *** significant at the 99% level.

Figure 6 shows the average number of employments for accommodation and food and the retail sector over time. Also included are econometrically estimated DID estimates.

The results indicate that the estimated increase in employment attributable to the 9% VAT rate between 2010 and 2012 is on average 1.8 employees for each accommodation or food business with sales at the reduced rate of 9%.

In repeating the analysis for the years 2014 and 2016, the estimated effects are larger. A statistically significant difference of on average 2.5 and 4.2 employments is estimated for the 9% traders between 2010 to 2014 and 2010 to 2016 respectively. Given the more time that elapses following the introduction of the 9% rate, it is more likely that the faster rate of employment growth observed for accommodation and food services after 2013 is attributable to other factors in the economy.¹⁶

¹⁶ It is worth reemphasising that Revenue's definition of the number of employments (jobs) is different from the number of employees. An employee may only be employed for a short period of time but be counted as an employment on Revenue's record.

Figure 6: Matching Analysis of Average Number of Employments

Source: Revenue analysis. Notes: * Indicates results are statistically significant at the 90% level, ** significant at the 95% level and *** significant at the 99% level.

3.5 VAT Revenue Foregone per Employment and Earnings Generated

Table 15 presents estimated the revenue foregone per euro of earnings generated for the cohort of businesses in food and accommodation that are used to calculate the DID estimates in Figure 5.¹⁷ The total tax revenue foregone on VAT on sales is calculated for these businesses as per Table 8.

For 2012, the 2,271 businesses in food and accommodation that with sales at the 9% rate increased their total salary costs by on average €6,644. The VAT forgone for these businesses amounts to €69 million. This generates a “tax subsidy” of €4.55 per euro of salaries paid by these businesses in 2012. However, the DID estimate is not significantly different from zero over the short term in 2012. Over the longer term, the tax subsidy per euro of earnings falls (as the salaries in food and accommodation increase) to €1.60 in 2014 and €1.07 in 2016.

Table 15: VAT Revenue Foregone per Euro Earnings Generated

Year	Total Foregone VAT on Sales	Number of Treated Businesses	DID Estimate	VAT Foregone per € of Earnings
2012	€68,593,127	2,271	€6,644	€4.55
2014	€69,400,729	2,231	€19,415	€1.60
2016	€74,583,820	2,113	€32,298	€1.07

Source: Revenue analysis. Note: Rounding may affect figures displayed.

¹⁷ Revenue Foregone per Euro Earnings = Total Foregone VAT on Sales / (# Treated businesses * DID Estimate).

Table 16 presents the VAT revenue foregone per employment for the cohort of businesses in food and accommodation used to calculate the DID estimates in Figure 6.¹⁸ The VAT foregone is calculated for these businesses as per Table 8.

For 2012, the 2,352 businesses in food and accommodation that traded at the 9% rate increased employment by on average 1.8 jobs each. The VAT forgone for these businesses amounts to €83 million. This generates a tax subsidy per employment of just over €19,000 in 2012. The tax subsidy per employment falls in the longer term as the number of jobs created by food and accommodation increase. The tax subsidy per employment falls to under €15,000 in 2014 and under €10,000 in 2016. As shown in Figure 6, statistical significance of the DID estimates varies over the period and this should be borne in mind when considering these results. It should be noted also that this analysis does not take into account the employment taxes paid by employees.

Table 16: Revenue Foregone per Employment Generated

Year	Total Foregone VAT on Sales	Number of Treated Businesses	DID Estimate	VAT Foregone per Employment
2012	€83,485,692	2,352	1.8	€19,249
2014	€84,299,675	2,312	2.5	€14,604
2016	€90,597,302	2,193	4.2	€9,743

Source: Revenue analysis. Notes: Rounding may affect figures displayed.

The conclusion from the matching analysis is that while there is evidence employments increased in accommodation and food, average total salary costs did not significantly increase in the years immediately following the introduction of the 9% rate. These result in a large amount of tax revenue foregone per euro of earnings generated in the short term. In the longer term, there is more evidence to suggest that both employments and average total salary costs increased in accommodation and food and that the tax revenue foregone per employment and salary falls. However as more time elapses, there is a greater likelihood that these findings are attributable to other factors as the economy rebounded after 2013.

¹⁸ Tax subsidy per Employment = Total Foregone VAT on Sales / (# Treated businesses * DID Estimate).

4 Conclusion

The 9% VAT rate was introduced along with a number of other initiatives intended to boost employment, in particular in the tourism sector following declines in visitor numbers to Ireland between 2007 and 2010 and the impact of this decline on employment within the sector. In addition to the cut in the VAT rate, a number of other elements of the Jobs Initiative were implemented including increased expenditure in marketing Ireland as a tourism destination, the removal of the air travel tax and reduction in airport fees, visa alignment with the UK and a number of other measures. In the years following 2011, a number of high profile tourism initiatives were launched (for example, "The Gathering" in 2013, the "Wild Atlantic Way" in 2014 and "Ireland's Ancient East" in 2015).

With the range of different initiatives since 2011, as well as the general and widespread changes in the economy over the same period (e.g., another factor may be increases in the national minimum wage, which would be significant in many of the 9% sectors), accurately isolating the impact of 9% rate alone is not possible.

This paper presents information on trend in VAT receipts and employment by businesses in the sectors of the economy trading in products liable for VAT at 9%. Overall the analysis indicates that the introduction of 9% reduced VAT rate has coincided with stronger growth in employment in 9% sectors. With the exception of the econometric matching analysis in Section 3.4, any correlations in trends with the 9% introduction should be treated with caution without assuming causation. The matching analysis suggests some limited evidence for a causal link to employment trends but the statistical significance of this is mixed.

As noted in the Introduction, this analysis is undertaken to support a Department of Finance's review of the 9% rate. Any policy conclusions from this analysis are a matter for the Department.

Appendix: Matching

This Appendix describes the econometric methods used to identify the effect of the reduced VAT rate on employments and total salary in accommodation and food services as it represents the sectors with the greatest share of companies in receipt of the 9% rate. The treatment evaluation literature is employed for this purpose.¹⁹ The treatment is defined as the 9% VAT rate on sales while the outcome is taken as employment and salary. The treatment group are the businesses (in accommodation and food) that conduct at least 20% of their sales at the 9% rate while the control group are businesses in the retail sector that do not.

If the assignment of goods and services to the 9% rate was completely randomised then the natural way of measuring the effect of the reduced rate would be to compare the average employment and salary of both the treated and non-treated firms. However, the Jobs Initiative targets the 9% rate mainly at labour intensive goods and services relating to tourism. Thus, the treated firms are systematically different from the non-treated firms, which is likely to invalidate causal comparisons of outcome by treatment status. For instance, if the probability of treatment is positively correlated to a firm's labour intensity then comparing average employment for the treated and untreated firms will overestimate the impact of the 9% rate.

However, the tax records essentially contain the information that determines firms' assignment to the 9% VAT rate. Each firm that receives a treatment can be matched to non-treated firms on the basis of these observable characteristics.²⁰

The relevant treatment effect is the Average Treatment Effect on the Treated (ATET). The ATET measures, for the firms who receive the 9% rate, the average change in employment and salary that is attributable to the reduced VAT rate.

Matching is conducted using available company level characteristics on tax records:

- Employment numbers
- Total wages
- Gross trading profits²¹
- Profitability to wages ratio²²
- Type of business²³ and

¹⁹ For further information refer to Cameron (2005), Chapter 25.

²⁰ Matching can be thought of as a way of finding randomised data from within an observational dataset. After conditioning on these characteristics the treatment is randomly assigned to each group.

²¹ Gross trading profits equals turnover less operational costs (including wages).

²² Profitability to wages ratio equals gross trading profits divided by total wages.

➤ Region²⁴

Estimation of the treatment effect of the 9% VAT rate is conducted using matched Difference-in-Difference (DID) estimates. A balanced panel is imposed over the period from 2010 to 2016 to ensure that the combinations of matched firms remain the same before and after the treatment. Firms in the treatment and control groups are matched on the basis of their characteristics before the introduction of the 9% rate, in 2010. As the RTD forms only became available after 2014, it is assumed that firms' product mix did not change substantially over the period.

Matching Methods

This analysis presents two types of matching methods: Mahalanobis Distance Matching (MDM) and Coarsened Exact Matching (CEM).²⁵ MDM is a popular matching method that matches firms to their "nearest neighbour" on the basis of their observable characteristics.²⁶

MDM is performed with replacement meaning that a firm in the control group may be matched to multiple treated firms. This is done even though the control group is large relative to the treatment group. Matching with replacement reduces bias as the closest possible matches are achieved. However, this is traded off against reducing variance as the number of unique firms in the control group falls. The single closest match in the control group is matched to each treated firm in order to minimise bias.

A limitation of MDM is that it can produce biased matches when the vector of observable characteristics is large or not normally distributed. This issue arises because MDM attempts to match firms on all their characteristics using equal weights thus creating a high dimensional array of possible matches.

CEM is a newer matching method proposed by Blackwell *et al.* (2009) and Iacus *et al.* (2012) with many appealing properties. CEM is conducted in three steps. First, each observable characteristic is divided (or coarsened) into categories. This step is equivalent to one which would be conducted if a histogram were to be produced. For instance, a

²³ The type of business is categorised into three types and is identified using the type of tax return filed with Revenue to declare profitability or wages. The first is where self-assessed taxpayers with relatively small businesses declare their income via the Form 11. The second is where income arising from partnerships is file via the Form 11. The third is the corporation tax return (CT1) which large businesses are required to file.

²⁴ Region refers to the location of the tax office that the company is registered with. Region is classified as follows: Dublin, Border Midlands West, East South East, South West and Large Cases Division.

²⁵ Propensity Score Matching is considered but not presented as the estimates exhibit poor balancing properties.

²⁶ There are many ex-ante ways of implementing the MDM estimation method. Caliendo and Kopeinig (2008) survey a range of possible implementation choices. MDM is estimated in STATA 13 using the psmatch2 command (Leuven and Sianesi, 2015).

continuous variable such as VAT on sales can be divided into twenty categories while a discrete variable such as region is naturally divided into five categories. The second step performs match of firms on the basis of their coarsened characteristics. Finally, the treatment effect can be identified using the original uncoarsened information. An advantage of the CEM procedure is that the balance between the treatment and control group can be chosen ex ante (Blackwell, 2009).

Identification Assumptions

Valid inference relies on a number of assumptions. To identify the treatment effect (ATET) it is assumed that employment in the absence of treatment (the untreated outcome) is unrelated to the selection for treatment, conditional on observable characteristics (this is known as the Conditional Independence Assumption). That is, it is assumed that the full set of characteristics that determine treatment assignment are observed in the data. This implies unobservable variables play no role in the treatment assignment and outcome determination.

Estimating treatment effects using DID requires additional assumptions. The first, known as the assumption of parallel trends, requires that employment in firms in both the treatment and control groups would have moved together over time in the absence of the Jobs Initiative. The second assumption imposes that the composition of the treatment and control groups did not change over time. This requires the assumption that firms had the same product mix before and after the Jobs Initiative.²⁷

For operational purposes, the overlap or matching condition requires for each treated firm there is another matched untreated firm with the same characteristics. Following common practice in the literature, the region of common support is restricted by setting the caliper (the maximum permissible distance of nearest neighbours) to one-fifth of the standard deviation of the probability of firms receiving treatment. The quality of the matches increase when a caliper is applied by reducing bias however, this is at the expense of increasing variance. Another important consideration is that the estimated treatment effect will exclude the treated firms that remain unmatched.

The balancing condition requires that assignment to treatment conditional on the propensity scores is unrelated to the observable characteristics. In other words whether a firm is treated or not does not depend on their characteristics, such as labour intensity, after accounting for the probability of receiving treatment (the propensity score). For

²⁷ An example where this assumption would fail is a pub that begins to sell food after the 9% VAT rate introduction.

example, conditional on the propensity scores, a highly labour intensive firm is equally likely to be treated or untreated.

Treatment evaluation methods assume that observations are independent and identically distributed. That is, the treatment received by one firm does not indirectly affect the employment of other firms through general equilibrium effects. However, this assumption may not hold if the 9% VAT rate has an indirect impact on the entire economy. If the 9% VAT rate were to have increased employment in firms that do not sell products at the rate (firms not in the treatment group) then the observed difference between the treated and matched untreated groups would be biased downwards.

Total Earnings Results

The treatment effect on total salary in accommodation and food services for the years 2012, 2014 and 2016 are presented in Table A1. Overall, there is no significant evidence to suggest that accommodation and food services increased their total salary costs when compared to a similar cohort of retail firms.

The results in Table A1 are interpreted as follows. Before the introduction of the 9% VAT rate in 2010, for the MDM method, matched firms in the treatment group had a total annual salary bill of €133,356 on average while the firms they are matched to in the control group paid on average €137,281. This means that the matched treated firms paid on average -€3,925 less than the control firms in 2010. But the difference is not statistically significant from zero. The same set of matched firms are used in 2012, 2014 and 2016. In 2012 the treated group paid €137,337 on average in total salary while the control group paid on average €134,619, resulting in a difference of €2,719.

The DID estimate is taken as the difference between the 2012 and 2010 differences. In this case the estimate of the increase in total annual salary attributable to the 9% VAT rate between 2010 and 2012 is on average €6,644 for each firm in receipt of the reduced rate. However, there is a large range of uncertainty associated with this estimate as the result is not statistically significant.

Over time the total annual salary bill increased in both the treatment and control group. However, total salary cost increased at a faster rate for the treatment group. Over time it appears that the impact of the 9% rate on the total annual salary bill increased. However, as more time elapses, it is less likely that the parallel trends assumption holds true.

The equivalent estimates using the CEM method show broadly similar trends despite largely predicting higher salary overall. However, the level of uncertainty also rises and the estimates are insignificant.

Table A1: Treatment Effect on Total Salary in Accommodation & Food (€)

	2012		2014		2016	
	MDM (1)	CEM (2)	MDM (3)	CEM (4)	MDM (5)	CEM (6)
Before (2010)						
Treated	133,356	235,228	133,356	235,228	133,356	235,228
Control	137,281	185,905	137,281	185,905	137,281	185,905
Difference	-3,925 (6,276)	49,323*** (11,819)	-3,925 (6,520)	49,323*** (12,426)	-3,925 (7,109)	49,323*** (14,061)
After						
Treated	137,337	243,175	150,351	261,052	174,271	301,815
Control	134,619	189,970	134,861	202,524	145,330	228,160
Diff	2,719 (6,375)	53,206*** (11,984)	15,490** (6,676)	58,527*** (12,704)	28,942** (7,499)	73,655*** (14,684)
Diff-in-Diff	6,664 (8,946)	3,883 (16,832)	19,415** (9,331)	9,205 (17,771)	32,866*** (10,333)	24,332 (20,330)

Source: Revenue analysis. Notes: The number of observations matched in 2010 for the MDM method is 2,333 (264 are not matched) and for the CEM method is 2,590 (7 are not matched).

* Indicates results are statistically significant at the 90% level, ** significant at the 95% level and *** significant at the 99% level. Standard errors are in parenthesis.

Employment Results

The treatment effect on the number of employments in accommodation and food services for the years 2012, 2014 and 2016 are shown in Table A2.

Before the introduction of the 9% VAT rate in 2010, for the MDM method, matched firms in the treatment group had 16.1 employments on average while the firms they are matched to in the control group had on average 9.2 employments. This is a statistically significant difference of 6.9 employments between the matched treated and control firms in 2010.

The same set of matched firms are used in 2012, 2014 and 2016. In 2012 the treated group had 18 employments on average while the control group had on average 9.3 employments, resulting in a difference of 8.7 employments. In this case the estimate of the increase in employment attributable to the 9% VAT rate between 2010 and 2012 is on average 1.8 employees for each firm in receipt of the reduced rate. The difference is significant at the 5% level which means that there is a moderate level of confidence that the estimate is statistically different to zero.

Over time employment increased in both the treatment and control group. However, employment increased at a faster rate for the treatment group. Over time it appears that the impact of the 9% rate on the number of employments increased as the DID estimate increased to on average 2.5 employments in 2014 and 4.2 in 2016. In addition, the level of significance is 5% and 1% respectively indicating greater levels of confidence in the results. However, given the greater time that elapsed between the “Before” and “After” periods it is less likely that the parallel trends assumptions holds and more likely that other factors are driving employment growth in accommodation and food services compared to the retail sector.

The equivalent estimates using the CEM method show broadly similar trends. While, the average number of employments is generally greater for both the treated and control groups before and after, the final DID estimate is broadly similar. However, the estimate for the period from 2010 to 2012 is insignificant and the estimates are larger for subsequent periods when compared to the MDM results.

Table A2: Treatment Effect on Number of Employments in Accommodation & Food

	2012		2014		2016	
	MDM (1)	CEM (2)	MDM (3)	CEM (4)	MDM (5)	CEM (6)
Before (2010)						
Treated	16.1	22.8	16.1	23.0	16.1	23.0
Control	9.2	11.2	9.2	11.1	9.2	11.1
Difference	6.9*** (0.6)	11.7*** (0.9)	6.9*** (0.7)	11.9 (1.0)	6.9*** (0.8)	11.9 (1.1)
After						
Treated	18.0	25.2	19.6	27.4	22.4	31.6
Control	9.3	11.7	10.2	12.6	11.3	13.7
Diff	8.7*** (0.6)	13.5*** (1.0)	9.4*** (0.7)	14.7 (1.0)	11.1*** (0.8)	17.9 (1.1)
Diff-in-Diff	1.8** (0.9)	1.8 (1.4)	2.5** (1.0)	3.0** (1.4)	4.2*** 1.1	6.3*** (1.6)

Source: Revenue analysis. Notes: The number of observations matched in 2010 for the MDM method is 2,416 (181 are not matched) and for the CEM method is 2590 (7 are not matched).

* Indicates results are statistically significant at the 90% level, ** significant at the 95% level and *** significant at the 99% level. Standard errors are in parenthesis.

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