

ECONOMIC IMPACT OF DEREGULATING SUNDAY TRADING

A REPORT FOR THE ASSOCIATION OF
CONVENIENCE STORES

SEPTEMBER 2015

Oxford Economics

Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modelling to UK companies and financial institutions expanding abroad. Since then, we have become one of the world's foremost independent global advisory firms, providing reports, forecasts and analytical tools on 200 countries, 100 industrial sectors and over 3,000 cities. Our best-of-class global economic and industry models and analytical tools give us an unparalleled ability to forecast external market trends and assess their economic, social and business impact.

Headquartered in Oxford, England, with regional centres in London, New York, and Singapore, Oxford Economics has offices across the globe in Belfast, Chicago, Dubai, Miami, Milan, Paris, Philadelphia, San Francisco, and Washington DC. We employ over 200 full-time people, including more than 130 professional economists, industry experts and business editors—one of the largest teams of macroeconomists and thought leadership specialists. Our global team is highly skilled in a full range of research techniques and thought leadership capabilities, from econometric modelling, scenario framing, and economic impact analysis to market surveys, case studies, expert panels, and web analytics. Underpinning our in-house expertise is a contributor network of over 500 economists, analysts and journalists around the world and our heritage with Oxford University and the academic community.

Oxford Economics is a key adviser to corporate, financial and government decision-makers and thought leaders. Our worldwide client base now comprises over 1000 international organisations, including leading multinational companies and financial institutions; key government bodies and trade associations; and top universities, consultancies, and think tanks.

September 2015

All data shown in tables and charts is Oxford Economics' own data, except where otherwise stated and cited in footnotes.

All information in this report is copyright © Oxford Economics Ltd.

This report is confidential to the Association of Convenience Stores (ACS) and may not be published or distributed without their prior written permission.

The modelling and results presented here are based on information provided by third parties, upon which Oxford Economics has relied in producing its report and forecasts in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

To discuss the report further please contact:

Neil McCullough nmccullough@oxfordeconomics.com

Oxford Economics

Broadwall House, 21 Broadwall, London, SE1 9PL, UK

Tel: +44 207 803 1400

TABLE OF CONTENTS

Executive summary.....	1
1. Introduction.....	3
2. The impact of liberalising Sunday trading rules	5
2.1 Impact on consumer behaviour.....	5
2.2 Impact on employment.....	6
2.3 Impact on prices.....	8
2.4 Impact on GDP.....	9
2.5 Impact on market competition and concentration	10
3. The impact of retail liberalisation in 1994.....	11
3.1 The impact of the 1994 change on employment.....	11
4. The impact of a shift from small to large stores	14
4.1 Displacement of turnover	15
4.2 Impact on employment.....	15
5. Conclusion.....	18
6. Technical Appendices	19

EXECUTIVE SUMMARY

1.3 million

Jobs in the non-specialised convenience sector.

50,000 small local convenience stores operate across England and Wales, providing some 386,000 jobs.

Further deregulation and devolution of the Sunday trading laws is proposed to be enacted in late 2015.

In the summer of 2015 the UK Government announced its intent to further liberalise Sunday trading rules by devolving decision-making on opening hours to local authorities. In so doing the Government is seeking to boost local and regional economies. This is based on apparent evidence from a research paper by Indepen that examined the effects of the previous 1994 liberalisation of trading laws and concluded that a further deregulation would result in benefits to consumers worth £1.4 billion per year.

The last major change was in 1994 when Sunday trading was introduced, but on a restricted basis for large stores.

The context is one in which Sunday trading has been partially liberalised for now two decades. In 1994 the Sunday Trading Act was introduced in England and Wales. The law allowed large shops, with a floor space of 280m² or 3,000 ft², to open on a Sunday for up to six hours between 10am and 6pm. Small shops were unaffected by the legislation and continued to be allowed to open unrestricted on Sundays. The 1994 deregulation applied to England and Wales; in Scotland, by contrast, there have never been restrictions on opening times. Since the 1994 reforms, much else has also changed in the retail environment: societal attitudes have shifted, leisure patterns changed, the internet has revolutionised shopping behaviours and the major supermarket retailers have entered the convenience market, setting up smaller stores through the UK.

Retail is a significant employer and source of economic activity. Any regulatory changes that have an impact on the retail sector will be potentially significant for consumers and retailers alike. The retail sector, as a whole, accounts for 9.2 percent of all jobs in the economy—employing over three million people in England and Wales. Of these 1.3 million (45 percent) are based in the non-specialised retail sub-sector that includes both large supermarkets and smaller convenience stores. Within this sector again, 50,000 small local convenience stores operate across England and Wales, providing some 386,000 jobs. The impact of any changes to the regulatory environment is likely to be keenly felt by these businesses and their employees, and in turn, by the customers they serve in local communities.

Extending Sunday opening hours is likely to result in displacement of spending. If devolving power over retail regulation to local authorities results in further deregulation of the sector we can expect that large stores will open for longer on Sundays. However consumers will have the same amount of money to spend, since the change is very unlikely to alter households' decisions about how much they want to spend and save. They may choose to spend their money in different ways as a result of deregulation, for example by shifting spending from non-retail sectors (such as leisure) to retail, or by shifting their spending from online companies to high-street and local shops. In neither of these scenarios however is there much theoretical reason to think that material shifts will occur as a result of deregulation. Two other effects are more likely. First, customer demand will be displaced from small stores – which currently face no restrictions on their Sunday trading – to large ones. Second, much of the new demand at large stores on a Sunday will be consumer spending that would otherwise have happened at some other point in the week.

1.9% decline

In employment in the non-specialised sub-sector.

The 1994 change had a negative impact on employment in the convenience sector.

-3,270 jobs

Net loss of convenience retail jobs, estimated from 2012.

Overall we estimate that had the temporary relaxation of Sunday trading regulations during the Olympics been made permanent they would have resulted in a net loss of 3,270 retail jobs in England and Wales.

The theoretical and international empirical evidence is mixed as to the likely economic impact of such changes. A range of studies have explored potential and actual impacts on consumer behaviour, prices, GDP and employment that have occurred as a result of changes in Sunday trading laws. Crucially the evidence calls into question the scale of positive economic impact for consumers that Indepen predicted. Overall the balance of evidence suggests that devolving Sunday trading decisions to local authorities, and the subsequent liberalisation that can be expected to occur, will have only a small impact on the retail sector as a whole, whether positive or negative. However, the displacement of spending from small to large stores may have an impact on employment patterns within the sector that can be expected to manifest itself in job losses at a local level.

Analysis of the impact of the 1994 reform reveals that within the convenience sector employment contracted. In the absence of conclusive evidence from the academic literature, we conducted an econometric analysis that explored the impact of the 1994 deregulation on employment levels in the non-specialised retail sector. This reform was similar in nature to that now proposed, while the rules in Scotland remained unchanged allowing retail patterns there to act as a benchmark for comparison. Our analysis found that the 1994 deregulation in England and Wales had a negative and statistically significant impact on employment for the sector. This is consistent with the theoretical understanding that the 1994 reform (and hence the one now proposed) resulted result in a shift in sales from small to large stores. This is because the higher productivity of larger stores means that fewer staff are needed to accommodate the same amount of turnover, resulting in a negative impact on employment. Our analysis found that the impact of the 1994 changes was a 1.9 percent fall in employment in the non-specialised sub-sector, equivalent to 17,250 jobs.

Analysis of more recent changes supports the hypothesis that, within the convenience sector, the proposed reforms will cause a shift in spending from small to large stores. Our analysis of the temporary liberalisation of Sunday trading laws during the Olympic period in 2012 adds further evidence to what this might mean in terms of the impact of the proposed reforms. From it we were able to estimate the potential impact of a permanent deregulation on employment within the convenience sector. This analysis confirms that the temporary deregulation resulted in a loss of sales for independent convenience stores within two miles of a large - temporarily deregulated – store, relative to those further away. Overall we estimate that if these changes in Sunday trading were made permanent they would have resulted in an annual loss of £870m of sales from all types of convenience stores, and an associated loss of 8,800 jobs. Replacement jobs could be expected to be created in the larger supermarkets that pick up these revenues, but higher productivity in these stores mean that only 5,530 replacement jobs would be expected. Overall then, we estimate that had the change been made permanent it would have resulted in a net loss of 3,270 retail jobs in England and Wales.

1. INTRODUCTION

In 1994 the Sunday Trading Act was introduced in England and Wales. The law allowed large shops, with a floor space of over 280m² or 3,000 ft², to open on a Sunday, for six hours, between 10am and 6pm. By contrast smaller shops were unaffected by the reform and continued to be allowed to open all day. The law applies to England and Wales; in Scotland, there are no restrictions on opening times at the national level either before or after 1994.

Having announced its intent at the time of the 2015 budget, the UK government in August 2015 published a consultation paper on the proposed devolution of Sunday trading regulations to local authorities to be introduced as part of an Enterprise Bill later in 2015. The expectation is that further deregulation will mean large stores see the remaining restrictions on their opening hours removed, taking the 1994 changes further.

The move is intended both to boost growth and strengthen local economies, especially outside London.¹ The argument in favour of the change is grounded in the apparent economic benefits that would follow from such liberalisation, as set out in a report published in 2006 that examined the experience of the earlier 1994 relaxation of Sunday trading rules.² It argues that further deregulation would result in benefits equivalent to £1.4bn per year to consumers.

Any regulatory changes that have an impact on the retail sector will be potentially significant for consumers and retailers alike. The retail sector as a whole accounts for 9.2 percent of all jobs in the economy—employing over three million people in England and Wales. Employment in the sector has yet to recover from pre-2008 levels but productivity, while consistently below the economy average, has recorded stronger growth than the general economy since 2011.

Amongst retailers, the non-specialised retail sub-sector, that includes both large supermarkets and smaller stores exclusively selling convenience goods (corner shops and the like) are likely to feel the effects of any changes more than most. In 2013 this sub-sector provided almost 1.3 million jobs; accounting for more than 45 percent of total retail employment.³ The sector is already very concentrated with 72.3 percent of market share being taken by just four retailers—Tesco, Sainsbury's, ASDA and Morrison's.⁴ Nonetheless over 50,000 small local convenience stores operate across England and Wales, providing some 386,000 jobs.⁵ For these stores and their employees the impact of any changes in the regulatory environment is likely to be keenly felt.

¹ Department for Business Innovation & Skills and Department for Communities and Local Government (2015), "Sunday Trading: Consultation on devolving Sunday trading rules"

² Indepen (2006), "The economic costs and benefits of easing Sunday shopping restrictions on large stores in England and Wales"

³ Business Register and Employer Survey

⁴ Kantar World Panel <http://www.kantarworldpanel.com/en/grocery-market-share/great-britain>

⁵ Association of Convenience Stores (2014), "The local shop report 2014"

This report seeks to explore the likely implications of such devolution and deregulation by examining theoretical and new empirical evidence. It explores a number of questions that are instructive in gaining an understanding of the likely impact of any further liberalisation on the non-specialised retail sector using two pieces of original quantitative analysis. First we explore how previous deregulation affected aggregate employment in the sector after the 1994 change. We then go on to examine the impact of the temporary deregulation of opening hours, during the period of the 2012 Olympic Games, and identify the effect of that change on convenience stores in particular.

2. THE IMPACT OF LIBERALISING SUNDAY TRADING RULES

As with any regulatory change, the effects of devolving and liberalising Sunday trading laws will be many and varied. The emotive response that accompanied the liberalisation of Sunday trading in 1994, and the ongoing localism debates being had in town halls countrywide over the impact of the supermarket sector on town centres and local employment, mean this change is unlikely to pass through either house of the UK parliament without significant comment. If devolution is implemented later in 2015, similar debates can be expected at a local level as councils seek to balance the effects of potential competition from neighbouring authorities and the competing demands of local and national retailers. In this context, a careful consideration of the theoretical and empirical evidence on the likely impact of the change, particularly on employment, is key.

2.1 IMPACT ON CONSUMER BEHAVIOUR

In exploring the likely economic effects in terms of employment and overall economic activity, the first step is to understand the different ways in which customers are likely to respond to the change. If devolving decision making on Sunday trading to local Councils results in deregulation of the sector then our assumption is that large stores will open for longer on Sundays than they currently do. With more competition in retail on Sundays, there could be several changes to people's behaviour. For example, consumers might, in response to greater opportunity, choose to spend more in total, thereby reducing the rate of household savings. Such a shift would theoretically boost both GDP and employment but there is little reason to suppose that households have not already optimised their saving and consumption behaviours for their own needs. Consequently, given the wide-ranging retail opportunities available to UK consumers already, we believe that lifting the remaining constraints on Sunday shopping is unlikely to result in higher aggregate demand.

Consumers will, rather, have the same amount of money to spend after deregulation as they did before. They may, however, choose to spend it in different ways, for example by shifting spending from non-retail sectors (such as leisure) to retail, or by shifting their spending from online companies to high-street and local shops. It is possible that the greater flexibility to shop could encourage some consumers to displace spending from other parts of the economy to retail. For example people may substitute spending on entertainment and hospitality with spending in retail. This would indeed push up retail sales and the sector's contribution to GDP, but at the expense of an offsetting reduction in the contribution made by the entertainment and hospitality sectors. Even if consumer behaviours do change at the margins therefore, this will unlikely have a significant impact on either GDP or employment in aggregate.⁶

⁶ In the first case the impact would depend on relative productivities in the sub-sectors of retail and how spending is being reallocated across these sub-sectors, with the most reasonable assumption being that there is no

Changes in two areas of consumer behaviour do, however, seem more likely to result from the deregulation. First, it is likely that customer demand will be displaced from small stores – which currently face no restrictions on their Sunday trading – to large ones. Second, it is likely that much of the new demand at large stores on a Sunday will be consumer spending that would otherwise have happened at some other point in the week. These represent the dominant economic effects we are likely to see.

For the purposes of this report we assume that these last two dynamics capture the main ways in which consumers would respond to the deregulation of trading hours. The next section goes on to consider the likely impact of them on employment, prices and GDP.

2.2 IMPACT ON EMPLOYMENT

The net employment effect of liberalising Sunday trading depends on a range of different cross-cutting effects. In the first instance, we might expect a boost to employment in the sector as retailers that open longer require more labour to run the stores.

As consumers take advantage of longer opening hours on a Sunday in large stores, spending will be displaced either from other parts of the retail sector, like small convenience stores, or from other days of the week, when customers would otherwise have visited the large store. Therefore it is reasonable to assume that other forms of retail will require less labour generally, and/or the large supermarkets will require less labour throughout the rest of the week.

These employment shifts, in response to changes in consumer behaviour echo the assumptions made in the Indepen report: *“As a simplifying assumption we assume that total retail sales remain constant with extended Sunday opening. Additional sales at some stores must therefore come from sales at other times, sales by other stores and out of future growth which would otherwise have to be accommodated by new capacity. We assume that this shift happens over a transitional period.”*⁷

If large stores are less labour intensive than smaller stores, the result will be a fall in employment in the sector. In principle this could be offset if liberalisation displaces expenditure from even less labour-intensive sub-sectors like online retail. Overall theory cannot tell us what the net effect will be. Instead we look to the empirical evidence of the impact of past deregulation of trading hours to provide an insight.

A recent study by the Centre for Economic Performance examined the experience of deregulation in Sunday trading across the seven European countries that have seen some change to their laws in the period between 1999

material shift towards retail as a result of deregulation. In the second example it is unclear that any marked effect would occur, particularly given the limited number of Sunday trading hours the deregulation would bring into play, and the type of retail that is most likely to be affected (i.e. grocery shopping).

⁷ Indepen (2006), “The economic costs and benefits of easing Sunday shopping restrictions on large stores in England and Wales” Page 39.

and 2013.⁸ Only two of the seven countries experienced full deregulation. In the case of Denmark the country moved from being “very restrictive” in the mid-2000s to being fully deregulated by the end of 2012. In Italy the country moved from allowing shops to open for eight Sundays per year to full liberalisation from 2012.

Across the seven countries with potentially relevant experiences the study found that deregulation resulted in a positive overall impact on employment in retail. Moreover, their own review of the literature, confirms our view that the theoretical employment impacts of Sunday trading deregulation are ambiguous. But, the authors argue: “the empirical literature provides strong evidence that lifting Sunday trading restrictions will increase employment”.⁹ In particular, the authors cite two studies from the US which found that restrictive trading laws reduced employment in the sector by over 4 percent.¹⁰

A further study on Canadian provinces found a similar result.¹¹ Sunday trading was completely restricted at the start of the 1980s, but from the early 1980s parts of Canada began to ease restrictions. The country continues to have a range of Sunday trading rules in place. Looking at Canadian provinces from 1980 to 1998, it found that relaxation and elimination of Sunday trading laws increased employment in regulated industries by 5 percent to 12 percent.

However, not all the evidence points in the same direction. In 2006, responsibility for shop opening hours in Germany shifted from the federal to the state level, which led to a gradual deregulation of shop opening restrictions in most of Germany’s sixteen states, a pattern that seems likely to follow on from devolution to local authorities in England and Wales. The evidence from Germany of this change suggests that there deregulation had a negative effect on retail employment, and that employment losses were most pronounced for small retail stores and almost exclusively borne by full-time employees.¹²

Of course the results in the existing literature mentioned above are not specific to the UK. Moreover both England and Wales have already experienced the 1994 Sunday Trading Act which, in allowing large stores to open for six hours on a Sunday for the first time, arguably brought with it the bulk of any disruptive impacts. Arguably, not only is the employment impact of the proposed liberalisation of Sunday trading unclear from past experience, but any impact on UK employment levels in aggregate may be marginal either way.

⁸ Genakos, C. and S. Danchev (2015), “Evaluating the Impact of Sunday Trading Deregulation” CEP Discussion Paper No 1336, Centre for Economic Performance. Thirty countries were examined in total. In thirteen of these countries, Sunday trading has been unrestricted from before 1999. In the remaining ten, some restrictions were evident and unchanged over the study period.

⁹ Genakos, C. and S. Danchev (2015), “Evaluating the Impact of Sunday Trading Deregulation” CEP Discussion Paper No 1336, Centre for Economic Performance, page 4.

¹⁰ Burda, M. and P. Weil (2005), “Blue Laws”, Working Paper and Goos, M. (2004), “Sinking the Blues: The Impact of Shop Closing Hours on Labour and Product Markets”, Center for Economic Performance Discussion Paper Series, No. 664 (December).

¹¹ Skuterud, M. (2005), “The Impact of Sunday Shopping on Employment and Hours of Work in the Retail Industry: Evidence from Canada”, European Economic Review, 49, 8, 1953–1978.

¹² Senftleben-König, C. (2014), “Product Market Deregulation and Employment Outcomes: Evidence from the German Retail Sector”, Humboldt University Discussion Paper, SFB 649.

2.3 IMPACT ON PRICES

Although retail is already a very competitive sector, prices could fall if Sunday trading liberalisation makes retail more competitive. If larger stores are more efficient than small ones or online retail, then a shift in demand towards them could cause prices to fall. On the other hand, reduced coordination of customers may mean that large stores become less efficient—opening longer and paying for more staff, only to see their revenues unchanged. Such an impact could cause prices to rise. Here again, the result is theoretically unclear, however there is some empirical work to draw upon.

The previously referenced study by the Centre for Economic Performance explores the academic evidence on the impact of changes to Sunday trading on prices paid by consumers.¹³ It concludes that the effect of deregulation on prices is ambiguous from a theoretical point of view.¹⁴ The study also concludes that the empirical evidence is mixed. Across the European countries examined changes in Sunday trading were found to have produced no significant impact on prices. The results of a wider literature review reinforce the ambiguity around the impact of liberalisation on prices. Evidence from Canada, Germany and the USA each found no significant impact on retail prices as a result of deregulated Sunday trading.¹⁵

Yet, in the Indepen study, which is cited in the Government Consultation paper¹⁶ as an influencing factor in proposals to devolve and deregulate Sunday trading, a large part of the apparent benefit that will accrue in economic terms arises from an underlying assumption of a fall in prices in larger stores that are subsequently adopted by the majority of the retail sector. The authors estimate this is equivalent to an annual saving to customers of £900 million. This estimate is constructed from the assumption that as supermarkets open longer on a Sunday, capital and operating costs remain fixed, with the exception of labour costs which rise proportionately with the increase in turnover that supermarkets capture. As a result, if revenue per extra hour of Sunday opening is entirely additional, unit costs are able to fall. But this is a very questionable assumption: Sunday custom is likely simply to be displaced from other outlets and times of the week. As discussed above, for this reason, the empirical evidence on the impact of deregulating Sunday trading on prices is far from certain.

¹³ Genakos, C. and S. Danchev (2015), “Evaluating the Impact of Sunday Trading Deregulation” CEP Discussion Paper No 1336, Centre for Economic Performance.

¹⁴ Clemenz, G. (1990), “Non-sequential Consumer Search and the Consequences of a Deregulation of Trading Hours”, *European Economic Review*, 34, 7, 1323–1337, argues that Sunday deregulation could lead to increased competition as consumers have longer to compare prices and this should result in a fall in prices. In addition De Meza (1984) forecasts a fall in prices and lower travelling costs. On the other hand Inderst and Irmen (2005) suggest it could lead to higher prices being charged as retailers stay open for longer.

¹⁵ Tanguay, G. A., L. Vallee and P. Lanoie (1995), “Shopping Hours and Price Levels in the Retailing Industry: A Theoretical and Empirical Analysis”, *Economic Inquiry*, 33, 3, 516–524. Reddy, K. (2012), “Price Effects of shopping Hours Regulation: Evidence from Germany”, *Economic Affairs*, February. Senftleben-König, C. (2014), “Product Market Deregulation and Employment Outcomes: Evidence from the German Retail Sector”, Humboldt University Discussion Paper, SFB 649.

¹⁶ Department for Business Innovation & Skills and Department for Communities and Local Government (2015), “Sunday Trading: Consultation on devolving Sunday trading rules”.

Indeed a critique of the Indepen paper undertaken by Europe Economics for ACS in May 2006 found that “certain assumptions used in the economic model are highly questionable”. In particular, the authors question the assumption that 90 percent of cost savings secured by retailers will flow through to reduced prices, and concluding that the report “should not be relied upon as a component of support for policy making.”¹⁷

2.4 IMPACT ON GDP

As described above, it seems implausible that consumers will spend more and save less in total as a result of the deregulation. And while it is possible that some consumers will displace spending from other parts of the economy to retail, the overall impact on GDP would likely be immaterial. A further argument suggests that without opening restrictions on a Sunday, retailers could capture spend from international tourists that might otherwise not have happened in the economy (i.e. they spend more in the UK due to increased opportunity, saving less at home). This is likely to be most relevant for city locations and key tourist destinations and it would provide a net boost to GDP its effect is likely to be very small.

The most likely source of a boost to GDP from the deregulation stems from changes in the efficiency of retail after deregulation. If more labour is required but sales remain unaffected the impact on productivity and hence GDP could be negative, while if efficiency increases a positive impact could result. Here again the overall effect is theoretically uncertain.

While there is evidence that deregulation of trading laws in the retail sector can lead to an increase in retail sales, the literature does not provide a consensus:

- Evidence from the US examined changes in Sunday trading laws from 1977 to 1997, comparing the 10 states that deregulated in this period with eight that still had Sunday Closing Laws in 1997. It found deregulation increased total revenue by 3.9 percent to 10.7 percent.¹⁸
- In Sweden, a study found an increase in turnover of 5 percent when regulations on the opening hours of stores were abolished in 1972.¹⁹
- However, the evidence from Germany in two studies found that deregulation in 2006 had no impact on sales in Germany.²⁰

In addition, even for those studies that did identify an increase in retail sales, it is not clear whether the increase was due to displacement of spending from other sectors of the economy. Therefore it is not possible to conclude with any

¹⁷ Europe Economics (2006), “Europe Economics’ appraisal of a report “The economic costs and benefits of easing Sunday shopping restrictions on large stores in England and Wales” by Indpen Consulting Limited for the DTI”, page 5.

¹⁸ Goos, M. (2004), “Sinking the Blues: The Impact of Shop Closing Hours on Labour and Product Markets”, Center for Economic Performance Discussion Paper Series, No. 664 (December).

¹⁹ Pilat, D. (1997), “Regulation and Performance in the Distribution Sector,” OECD Economics Department Working Papers 180, OECD Publishing.

²⁰ Senftleben-König, C. (2014), “Product Market Deregulation and Employment Outcomes: Evidence from the German Retail Sector”, Humboldt University Discussion Paper, SFB 649. Reddy, K. (2012), “Price Effects of shopping Hours Regulation: Evidence from Germany”, Economic Affairs, February.

certainty that an increase in retail sales will translate through to an increase in national GDP.

Alongside the £900 million estimated benefit to customers through lower prices following deregulation, Indepen calculate that there could be a further £500 million boost to GDP from the perceived non-monetary benefits that customers place on being able to shop on a Sunday. The study estimates that benefits from the ability to coordinate trips are worth £300 million, while benefits from reduced congestion are worth an estimated £200 million. These figures represent the cost of time saved, which is then converted into monetary values using an assumed value of leisure time. This is an approach often used to calculate non-market benefits for transport planning purposes. However, as a measure of non-market benefit, while it can be expressed in monetary terms, this collective £500 million does not represent a boost to GDP.

2.5 IMPACT ON MARKET COMPETITION AND CONCENTRATION

As noted above, deregulation of the retail sector could result in higher levels of competition. If the costs of opening or extending opening on a Sunday are lower than the extra revenue captured, then profits should rise for those units affected by the deregulation. This could result in more shops being set up: the study by Goos found that deregulation in US states boosted the number of shops by 1.0 percent to 1.5 percent.²¹

Likewise analysis undertaken by Genakos and Danchev in 20 countries throughout Europe also found that deregulation of restrictive Sunday trading hours tended to have a positive impact “on the number of firms competing in the market.”²² They found a net increase of one percent in the number of firms entering the market after deregulation. Though across the 16 retail sub-sectors in the study only three or four (depending on the approach) experienced an increase in the number of firms. Indeed two sectors experienced a reduction in the number of firms and hence an increase in market concentration. However the authors were unable to confirm if sales moved towards larger firms.

²¹Goos, M. (2004), “Sinking the Blues: The Impact of Shop Closing Hours on Labour and Product Markets”, Center for Economic Performance Discussion Paper Series, No. 664 (December).

²² Genakos, C. and S. Danchev (2015), “Evaluating the Impact of Sunday Trading Deregulation” CEP Discussion Paper No 1336, Centre for Economic Performance, page 3.

3. THE IMPACT OF RETAIL LIBERALISATION IN 1994

Many of the policy reforms explored in the academic papers discussed in section three are very different from the one now being proposed in the UK. In addition few were undertaken in the age of mass internet retail or in a context of the major supermarket retailers having moved into the smaller convenience store market. Given that countries have very different approaches to regulating retail and more importantly for this study the non-specialised retail sector, it is important to retain a measure of caution about interpreting findings from elsewhere and assuming similar effects will be evident in the UK.

In the UK context, the experience of the non-specialised retail sector in response to the 1994 changes potentially provides a more instructive evidence base. The following section explores the net effect of that change on the sub-sector's performance to elucidate the discussion on the expected impact of any further deregulation.

As noted earlier, the 1994 Sunday Trading Act allowed large shops in England and Wales to open on a Sunday, but restricted their opening times as set out above. Shops with a floor space of over 280m² were allowed to open for six hours, between 10am and 6pm. By contrast smaller shops, unaffected by the legislation, were allowed to continue to open all day on Sunday. In Scotland there were no restrictions on opening times.

The 1994 change was a significant change to Sunday trading laws, representing a larger step change than the current proposals. But crucially – and in terms of the relative impact on small and large stores – it was a move in the same direction as the legislation now proposed. Hence evidence from its introduction offers lessons for today.

3.1 THE IMPACT OF THE 1994 CHANGE ON EMPLOYMENT

To explore the economic impact of the 1994 change, particularly on employment, we have developed a set of bespoke econometric models. Econometric techniques make use of mathematical and statistical methods, for example to understand the impact of a change in policy on key variables of interest. In this context they allow us to consider the impact that the deregulation had on employment. Our measure relates to the number of persons employed in, specifically, non-specialised retail sale stores. This employment data is sourced from Structural Business Statistics (SBS), Eurostat.

A number of econometric techniques were used to build our Difference-in-Difference (DID) model—a statistical technique that compares the performance of at least two datasets over time.²³ These include Fixed Effects (FE), Random

²³ A difference in difference model is a statistical technique that compares the performance of at least two datasets over time. In this case we look at regional employment over the period 1988 to 1999. In 1994 the

Effects (RE) and system GMM approach. A full description of these models is provided in the technical annex. Our analysis identified the FE model as our preferred approach under both definitions of employment. The results of this analysis are highlighted in the table below.

Our modelling reveals an employment contraction of 1.9 percent in employment in the non-specialised sector, attributable to the introduction of Sunday trading. This is the measure most closely aligned to the convenience sector. And the results bear out the theoretical outcome we would expect, driven by a displacement of revenues from small to large stores, and from Monday-to-Saturday to Sunday, combined with labour productivity increasing with shop size. Essentially, within the non-specialised sector more spending transfers to bigger stores who use fewer staff so employment declines.

Table 4.1: Econometric models – Employment measure II (1991-2000)

Employment	Static models		Dynamic models	
	RE	FE	FE	System GMM
Lag of employment	-	-	0.55***	1.45***
Log Wage	0.87***	0.81***	0.36***	-0.48
Log GVA	0.09	0.12	0.20**	0.04
Treatment period dummy	0.06***	0.5***	0.04***	-0.03
Sunday trading effect	-0.01	0.00	-0.019***	0.04
Constant	1.00	1.39	-0.45	-0.09
Number of observations	110	110	99	99
Robustness tests				
Heteroscedasticity	Heteroscedasticity is present		Corrected	Corrected
Sargan-Hansen	FE model is preferred to RE		N/A	N/A
Serial correlation test	Serial correlation is present		N/A	N/A
Nickell Bias	N/A	N/A	N/A	Failed
Arrelano-Bond test AR (2)	N/A	N/A	N/A	Failed
Hansen Test	N/A	N/A	N/A	Passed

*Legend: The highlighted model is our preferred model. * Significant at 10%, ** 5% and *** 1%.*

This analysis has demonstrated the likely direction of impact on employment that could result from the proposed legislation in aggregate. But the new measures, even if widely adopted, are not as radical a departure as the 1994 reforms, since large stores do now open on Sundays.

English and Welsh regions are subject to the Sunday Trading Act. Scotland however is not exposed to the regulations, allowing us to model the difference in performance.

Nevertheless, the impact, particularly on smaller stores could still be significant. The following section examines very recent evidence from the period in 2012 when Sunday trading laws were relaxed during the London Olympic Games, to see what impact changing today's regulations might have on small stores.

4. THE IMPACT OF A SHIFT FROM SMALL TO LARGE STORES

In concluding that further liberalisation of Sunday trading laws will provide a boost to GDP the Indepen report fails to consider the impact that will be felt in the smaller convenience store sector. Here a loss of revenues can be expected to lead to job losses and the possible closure of stores, which may reduce convenience for some consumers. As well as the impact on consumers, this would affect the employers and small businesses that generate economic activity at a local level. Given that the decision on deregulation will, under the new legislation, be devolved to local authorities, understanding likely impacts at a local level is key.

The previous analysis showed that there was a small negative employment effect in the non-specialised retail sector overall as a result of the 1994 deregulation of Sunday Trading. The new reforms are likely to have a similar direction of impact, albeit of a smaller magnitude. However, the local impact could be significantly greater than the aggregate effect makes it appear.

This section explores the possible impact of liberalisation of different types of retail store *within* the sector—that is the different effects that will likely be felt by large stores and their employees vis-à-vis smaller stores within the convenience sector. To do so we examine the impact of the temporary liberalisation of Sunday trading laws on large stores during the period when the UK hosted the Olympics. The relaxation to trading hours was applied to the whole of England and Wales. It covered eight Sundays in total from the 22nd July to the 9th September 2012 inclusive.

In order to capture the effect of the policy change we conducted a statistical analysis of survey data collected for a separate study which Oxford Economics undertook in November 2012.²⁴ These techniques capture the impact of the extension of trading hours on average weekly sales. We provide a detailed discussion of our econometric approach in Annex A.

The results revealed that, in terms of impact on the average Sunday sales of convenience stores, and as might be expected, proximity to a large supermarket mattered. The impact of deregulation was strongest for convenience stores that had supermarkets within a one mile radius, and stores lying between one and two miles of a supermarket were also affected much more than those further away. We therefore used those stores with supermarkets beyond two miles as a control group and examined their performance relative others lying closer to the newly deregulated stores. The control group captured the broader trends affecting retail in general in England and Wales over the period, allowing us to strip out any wider 'Olympics effect' from the impact of the deregulation measure itself.

²⁴ Oxford Economics (2012) "The impact of Olympic Sunday trading liberalisation on convenience store turnover" for the Association of Convenience Stores.

Our analysis primarily details estimates for the independent convenience sector.²⁵ However, we also estimate the impact of the policy change on convenience stores operated by large retail multiples.²⁶

4.1 DISPLACEMENT OF TURNOVER

The results of our econometric analysis reveal that independent convenience stores (excluding the convenience stores of large retail multiples) within a mile of a supermarket are estimated to have experienced a fall in average weekly sales of £1,306 (or 3.4% of weekly sales). This translates to an annual loss of £350m from the independent convenience sector.²⁷

For independent convenience stores that have a supermarket within a two mile radius (i.e. including the above), the decline in average weekly sales is estimated to be £1,204 (or 3.1% of weekly sales). Over the course of a year this would amount to a loss of approximately £590m in sales from the independent convenience store sector.

If we include the convenience stores operated by large retailers (e.g. Tesco Express and Sainsbury's Local) in our estimation, we find annual losses rise to an estimated £870m.

4.2 IMPACT ON EMPLOYMENT

Using estimates of relative productivity in convenience stores and large supermarkets, we can calculate the likely employment effects from the shift in turnover from one to the other. Our analysis assumes that the turnover lost by convenience stores is absorbed by large supermarkets. In other words, we assume economic activity within the sector remains unchanged at the aggregate level. Annex A provides an explanation of how we estimate relative productivity within the non-specialised retail sector in the UK.

While overall activity can be assumed to remain constant in the face of deregulation, the same cannot be said for employment. Our results suggest that had the temporary liberalisation been made permanent, and on existing productivity relativities, convenience stores would have suffered job losses of nearly 6,770 in England and Wales. This is equivalent to a 1.8 percent decline in the total number of jobs in the convenience sector across the UK.

In addition we estimate that convenience stores operated by large retail multiples experience a further loss, as the larger supermarkets are allowed to open for longer. We estimate £270m of sales in this sub-set of convenience

²⁵ By this we mean all convenience stores with the exception of convenience multiples of Tesco, Sainsbury and Morrisons.

²⁶ We have estimated the convenience offering for Tesco, Sainsbury's and Morrison's. This is largely based on publicly available information published in their annual reports.

²⁷ We assume stores beyond two miles are unaffected. The total impact on English and Welsh convenience stores (excluding large supermarket multiples) that have a supermarket within two miles stands at £1.8bn, therefore £1.1bn represents 60% of the total impact. To aggregate up to a year, we assume there are 363 days in the year (Easter Sunday and Christmas day are treated as days exempt from the liberalisation of Sunday trading laws).

stores is also lost to large supermarkets. This loss of sales is equivalent to an estimated 2,030 jobs.

The reduction in convenience sector jobs is partially offset by the job creation at large supermarkets. The displacement of consumer spending, from independent convenience stores to large supermarkets, is estimated to be enough to support nearly 5,530 new jobs in large supermarkets in England and Wales. This is equivalent to a 0.6 percent increase in the UK supermarket employment.

Table 4.1: The first round of impacts from deregulation, using the Olympics experience

Estimated employment impact	Estimated sales (£m)	Estimated jobs	% change in estimated jobs (relative to UK)	Estimated sales per job (UK)
Convenience stores	-£590	-6,770	-1.8%	£87,391
Supermarket convenience multiples	-£270	-2,030	-1.8%	£135,212
Large supermarkets	£870	5,530	0.6%	£156,565
Non-specialised retail sector	£0	-3,270	-0.2%	£137,110

Note: may not add due to rounding

The net effect of these changes is therefore a loss of an estimated 3,270 jobs in England and Wales. Differences in productivity (measured by sales over jobs) explain the varying impact on jobs (in absolute terms) between convenience stores and large supermarkets. Productivity in large supermarkets (with sales per job of £156,000) is above that of convenience stores - both independent convenience stores (£87,000 per job) and those of the large retail multiples (estimated at approximately £135,000 per job).

The estimates of job loss above are likely to be an under-estimate of the impact of deregulated Sunday trading for at least two reasons. First, the nature of the analysis means that we have had to assume that convenience stores with a supermarket within 2 miles would be unaffected by deregulation. While they are likely to feel a much smaller impact, convenience store with strong out of town shopping options within a few miles are also likely to be affected. This dynamic means that our estimates are inevitably conservative. Finally, it is likely that it will take a longer period of time than the eight weeks of the Olympics for consumers in England and Wales to change their shopping behaviour, so such short-term analysis can only be part of the picture. For these reasons, at least, the sales and thus employment impacts of liberalising Sunday trading are likely to be higher than stated here.

In summary, we find that the relaxation of Sunday trading over the London Olympic period resulted in a loss of sales for convenience stores in England and Wales. On this basis, we estimate that if the change in Sunday trading laws during the Olympics were made permanent, as is broadly now proposed, it could result in a shift of £870m of sales from convenience stores of all types to large supermarkets each year.

Using performance metrics for the different types of convenience store and supermarket we estimate the net effect would be a loss of 3,270 retail jobs in England and Wales.

5. CONCLUSION

As we have explored, a wide range of evidence is available that is instructive in understanding the possible impact of the further changes to Sunday trading rules that have been proposed by the UK government. The theoretical and international empirical evidence shows that the dynamics involved in deregulating Sunday trading can work in different directions. However the most obvious theoretical effects we would expect to see under the proposed reform point in the direction of net job losses.

Our own econometric analysis adds important insights, particularly in terms of the likely impact of the changes not only on the retail sector as a whole but on the way in which different types of retailers, especially those in the independent convenience sector, might be affected if the proposed legislation is introduced.

As we have seen, analysis of the 1994 reform – which was similar in its direction of travel - reveals that within the convenience sector deregulation had a negative and statistically significant impact on employment. This is consistent with the idea that sales shifted from smaller to larger stores following the deregulation. The higher productivity of larger stores, in turn, meant that fewer staff were needed to accommodate the same amount of turnover and therefore there was a negative impact on employment in the sector. Our analysis found that the impact of the 1994 changes was a 1.9 percent fall in employment in the non-specialised sub-sector, equivalent to 17,250 jobs.

While the 1994 reform was arguably bigger in scale than that now proposed, recent history allows us to identify the significant likely impact of further deregulation. Temporary liberalisation of Sunday trading laws during the period of the Olympic Games in 2012 allows us an insight into what might happen. Our analysis of this period adds further support to the hypothesis that within the convenience sector the proposed reforms will cause a shift in spending from small to large stores. Small stores far from large supermarkets can expect to be far less affected but those within a two mile radius of a major supermarket will potentially see revenues fall, with a resulting impact on employment within the independent convenience store sector. Moreover, those losses do not seem likely to be offset by gains in employment in the larger stores.

6. TECHNICAL APPENDICES

Analysing the impact of the temporary deregulation of Sunday Trading over the Olympics period

Our analysis is based on using a difference-in-difference (DD) approach. This method compares the difference in change of sales before and after the policy implementation across two groups of units: those affected by the policy change and those not affected. In our case, we treat the time either side of the Olympics as a period of no policy change to Sunday trading. The two groups considered in our approach include those convenience stores that have a supermarket within a one or two mile radius.

This is estimated using the following regression analysis.

$$Y = C + \beta_1 \text{Treated} + \beta_2 \text{Sun_Trad} + \beta_3 (\text{Treated} \times \text{Sun_Trad}) + \beta_4 \text{Other}$$

Where:

- Y : average sales (£)
- β_1 : shows the difference in average sales between stores affected by trading and those not affected. This drops out in a Fixed Effect Model (FEM) but not a Random Effect Model (REM).
- β_2 : estimates an increase/decrease in average sales of £x for convenience stores at the time when trading laws were relaxed. This regression coefficient includes stores that are affected by Sunday trading and those that are not affected.
- β_3 : estimates the difference-in-difference. In other words, this captures the difference in change of sales before and after the policy implementation across those that are affected and those that are not affected. **This is the most important regression coefficient in our analysis.**
- β_4 : estimates the impact on sales from other variables including regional dummies and time trend (DateID).

We use survey data that was collected for the Olympic Study 2012. This data was collated with the assistance of ACS (in providing contact details for personnel responsible for data collection at nine of the UK's leading convenience store chains). The dataset consists of sales for over 3,000 stores across England and Wales. The data spans over a four week period prior to the liberalisation of trading hours, the eight week period itself, and for the four week period after the Olympics.

Given our data consists of store level data over time; we use panel regression to estimate the relationship between average Sunday sales of convenience stores and explanatory variables as detailed above. As part of this analysis we define our 'treated' variables as those convenience stores that have supermarkets within one or two miles from their location. While our 'control' variable assumes that stores with supermarkets beyond two miles are unaffected by the

relaxation of trading laws. This approach of ‘treated’ and ‘control’ variables are used to set the context when interpreting the regression coefficients of β_3 .

As an initial step we estimate the model using the FEM and REM. This step is undertaken to highlight which model should be used. The results from the two approaches produce marginal differences. The Hausman test is used to test which model is more appropriate to use. The null hypothesis of the Hausman test is that the fixed and random effects model do not differ significantly from each other. A significant test statistic means that we reject the null. Note that the ‘treated’ variable and regional dummies are dropped in the FEM as the variables are fixed over time.

The results estimate an increase in average sales for convenience stores at the time when trading laws were relaxed. This includes stores that are affected by Sunday trading and those that are not affected. However this positive result may appear counterintuitive as economic theory suggests that the impact on convenience stores would be negative. Instead this positive impact is a reflection of the Olympics which coincides with the relaxation of the trading laws.

As explained earlier, to estimate the impact of Sunday trading, we need to compare the change in sales of convenience stores affected by Sunday trading (‘treated’) with the change in sales of unaffected firms (‘control’). The regression coefficient of β_3 provides this estimate – standing at -£293.

Dynamic Panel Data	
Sales	Fixed Effect
Lag of Sales	0.198***
Treatment period dummy	212.8***
Sunday trading effect (1 mile)	-293.2***
Time trend	-18.4***
Constant	4555.9***
Number of observations	29,707
Robustness tests	
Heteroscedasticity	Corrected

Econometric theory suggests the loss in sales will be larger for convenience stores that are closer to a supermarket. This notion is reflected in the results below when considering those stores within one mile of a supermarket. The change in sales of convenience stores affected by Sunday trading (‘treated’) with the change in sales

of unaffected firms ('control') is estimated at -£261.

Dynamic Panel Data	
Sales	Fixed Effect
Lag of Sales	0.184***
Treatment period dummy	215.8***
Sunday trading effect (2 miles)	-261.7***
Time trend	-18.6***
Constant	4553.9***
Number of observations	42,667
Robustness tests	
Heteroscedasticity	Corrected

Estimating the relative performance between types of retail stores

The difference-in-difference analysis above produces estimates of the likely turnover displaced from convenience stores to larger supermarkets. To work out the impact on jobs we needed to understand the relative performance metrics between three types of retail business that are found in the non-specialised retail sub-sector, namely:

- Convenience stores;
- Large supermarkets; and
- The convenience stores run by the large supermarket chains.

To estimate the jobs, sales / turnover and GVA in the convenience store sector of non-specialised retail we used two reports published by the Association of Convenience Stores (ACS). "The local shop report 2014" provides data on the number of shops, retail sales, jobs in England, Wales and Scotland for 2013 and 2014. "The local shop report 2014" provides data on average turnover, profits and costs by type of convenience store. It also provides information on the number of convenience stores by type along with a breakdown of costs (e.g. store staff and management costs). Using the above we worked out sales / turnover, jobs and GVA in the sector (the report does not provide data for Northern Ireland. As such we estimated Northern Ireland's convenience store sector by using Great Britain averages.).

The data in the ACS documents include some convenience stores owned and operated by the large retail multiples. Using the raw data from the ACS reports and published accounts and annual reports

from the likes of Tesco, Sainsbury's and Morrison's, we were able to estimate the size of this convenience offering in terms of employment, sales and stores.

Published accounts and reports for Sainsbury's suggest that their convenience stores have £2.1bn of sales and 16,000 jobs²⁸. Infographics from other Sainsbury's reports²⁹ show the total number of jobs in business and the breakdown of the type of jobs, so we could estimate the number employed in large supermarkets. Given the availability of published information on retail sales for the company and the fact we knew the size of sales in their convenience stores, we could isolate retail sales from their larger supermarkets. Therefore we were able to estimate jobs and sales across both parts of Sainsbury's.

Tesco's "Annual Report and Financial Statements 2015" provides data on overall retail sales, jobs and average sales per square foot. It also provides data on the number of shops and the floorspace by type of Tesco store. Using the sales per square foot and the floorspace information, we could have produced a crude level of sales for each type of Tesco store. However we knew that convenience stores in Sainsbury's achieve higher sales per square foot³⁰ and we assumed Tesco would experience a similar uplift in their convenience stores. Therefore we applied this sales premium to the calculation of sales per square foot in convenience stores.

Morrison's "Annual Report and Financial Statements 2014/15" provided data on retail sales, internet sales and jobs. A news article by Reuters provided data on sales in the convenience stores³¹. We were therefore able to estimate sales in larger supermarkets. Morrison's annual reports also provided sales per square foot and a breakdown of the number of stores by type. A news article in the "Grocer"³² suggested that Morrison's was to close 23 convenience stores with the loss of 300 jobs. Using the average jobs per store in this article we were able to estimate jobs across all of Morrison's convenience stores and given we knew total jobs in Morrison's we are able to estimate the number of jobs in their large supermarkets.

The Annual Business Survey (ABS) provides data on employment, and turnover for the non-specialised retail sector in Great Britain. By removing the activity of convenience stores as measured by the ACS material, and the activity in convenience stores of the large retail multiples, we were to isolate the remainder of the sector which we

²⁸ http://www.j-sainsbury.co.uk/media/2475802/sainsburys_ar_2015.pdf

²⁹ http://j-sainsbury.co.uk/media/2064053/sainsbury_s_annual_report_and_accounts_13-14.pdf

³⁰ http://www.j-sainsbury.co.uk/media/2475907/sainsburys_ar_2015.pdf

³¹ <http://uk.reuters.com/article/2015/08/17/uk-morrison-convenience-idUKKCN0QM13F20150817>

³² <http://www.thegrocer.co.uk/channels/convenience/morrisons-reported-to-be-on-verge-of-m-local-sale/523297.article>

assumed was large supermarkets.

DESCRIPTION OF MODELS USED IN THE ANALYSIS

Fixed Effects Model

A FE model is a useful econometric application when the user is interested in analysing the impact of variables that vary over time. In the context of this report, we use the FE approach to explore the relationship between predictor variables e.g. wage, GVA, and the outcome variable (i.e. employment) within an entity (i.e. a given region i's).

Consider the following static panel data model:

$$y_{it} = c + \beta x_{it} + \mu_i + \varepsilon_{it} \quad i = 1, \dots, N; t = 1, \dots, T.$$

For the purposes of this discussion it is assumed that the micro data available have an N that is much larger relative to T . μ_i is known as the fixed effects element.

A crucial assumption of the FE model is that μ_i , which is also referred to as the entity's individual characteristics are fixed over time. This assumption allows the FE model to remove the effect of those time-invariant characteristics from the predictor variables so we can assess the predictor's net effect. The fixed effect is eliminated via the within transformation as show below

$$(y_{it} - \bar{y}_i) = \beta(x_{it} - \bar{x}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i)$$

Where $\bar{y}_i = \frac{1}{T} \sum_{t=1}^T y_{it}$; $\bar{x}_i = \frac{1}{T} \sum_{t=1}^T x_{it}$; $\bar{\varepsilon}_i = \frac{1}{T} \sum_{t=1}^T \varepsilon_{it}$ are the time averages. The individual fixed effect μ_i and the intercept c cancel. Also note that any time-invariant regressors (e.g. constant) will also be cancelled out.

The FE estimator or within estimator of the slope coefficient β estimates the within model by OLS under the assumption that the x_{it} is independent from the ε_{it} in the model described above.

Random Effects Model

Unlike the FE model, the RE model assumes the variation across entities to be random and uncorrelated with the independent variables included in the model. More specifically, the RE assumes that the individual specific effect is uncorrelated with the explanatory variables of all past, current and future time periods of the same individual.

"...the crucial distinction between fixed and random effects is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not" [Greene, 2008, p.183]

The Hausman test is used to evaluate which model between the FE and RE should be used. This is simply based on testing whether the entity's error terms are correlated, if they are a FE is not suitable and

a RE model should be used instead. Note that the Hausman test is only valid under homoscedasticity and cannot include time fixed effects. A better alternative to the Hausman test for choosing between FE or RE models is the Sargan-Hansen test, which is robust in the presence of heteroscedasticity.

GMM Estimator for Dynamic Panel

We first explain how the GMM estimator is derived in its general form, and then we show how the approach is applied in a dynamic panel data framework.

GMM is based on moment functions that depend on observable random variables and unknown parameters, and that have zero expectation in the population when evaluated at the true parameters. Assume the following expectation function:

$$E[g(w_i, \theta)] = 0,$$

Where: g is the moment function, w_i is a vector of observable random variables and is θ a $P \times 1$ vector of unknown parameters. The moment function g can be linear or nonlinear. We will consider the former case, since the latter requires numerical methods treatments.

In linear models a natural way of writing the moment function is as

$$Z_i'(y_i - X_i\theta), \text{ since } E[Z_i'(y_i - X_i\theta)] = 0$$

Provided we have a random sample, we can assume that the random sample is an analogy of the population and replace population moments by sample moments. This enables us to estimate the econometric model using a sample of data.

Hansen (1982)³³ proposes to bring the sample moments as close to zero as possible by minimizing the following quadratic form

$$\min_{\theta} \left[\sum_{i=1}^N g(w_i, \theta) \right]' \cdot C \cdot \left[\sum_{i=1}^N g(w_i, \theta) \right]$$

(1×L) (L×L) (L×1)

with respect to the parameters θ , where C is a positive definite $L \times L$ weighting matrix. It can be shown that this yields a consistent estimator of θ , under certain regularity conditions (see theorem 14.1 in Wooldridge, 2002)³⁴.

³³ Hansen (1982), L. P. "Large Sample Properties of Generalized Method of Moments Estimators", *Econometrica*, Vol. 50 Issue 4, pp. 1029-54.

³⁴ Wooldridge, J. (2002), "Econometric Analysis of Cross Section and Panel Data", MIT Press.

Provided that the moment functions are continuously differentiable, the GMM estimator satisfies the first-order condition:

$$\left[\sum_{i=1}^N \nabla_{\theta} g(w_i, \hat{\theta}) \right]' \cdot \underset{(L \times L)}{C} \cdot \left[\sum_{i=1}^N g(w_i, \hat{\theta}) \right] = 0$$

$(P \times L) \qquad (L \times 1) \quad (P \times 1)$

$$\nabla_{\theta} g(w_i, \hat{\theta}) = \begin{bmatrix} \frac{\partial}{\partial \theta_1} g(w_i; \hat{\theta}_1, \hat{\theta}_2, \dots, \hat{\theta}_p)' \\ \frac{\partial}{\partial \theta_2} g(w_i; \hat{\theta}_1, \hat{\theta}_2, \dots, \hat{\theta}_p)' \\ \dots \\ \frac{\partial}{\partial \theta_p} g(w_i; \hat{\theta}_1, \hat{\theta}_2, \dots, \hat{\theta}_p)' \end{bmatrix}$$

Where $\nabla_{\theta} g(w_i, \hat{\theta})$ is an $L \times P$ vector of derivatives of the moment function g with respect to the first, second, etc. element of the parameter vector θ .

Re-writing the above for the linear model, we have

$$g(w_i, \theta) = Z_i'(y_i - X_i\theta),$$

Hence:

$$\begin{aligned} \frac{\partial}{\partial \theta_1} g(w_i; \theta_1, \theta_2, \dots, \theta_p) &= -Z_i' x_{1i} \quad (L \times 1) \\ \frac{\partial}{\partial \theta_2} g(w_i; \theta_1, \theta_2, \dots, \theta_p) &= -Z_i' x_{2i} \quad (L \times 1) \\ &\dots \\ \frac{\partial}{\partial \theta_p} g(w_i; \theta_1, \theta_2, \dots, \theta_p) &= -Z_i' x_{pi} \quad (L \times 1) \end{aligned}$$

And so:

$$\nabla_{\theta} g(w_i, \theta) = [-Z_i' x_{1i} \quad -Z_i' x_{2i} \quad \dots \quad -Z_i' x_{pi}] = -Z_i' X_i$$

The FOC becomes:

$$\left[\sum_{i=1}^N Z_i' X_i \right]' \cdot C \cdot \left[\sum_{i=1}^N Z_i' (y_i - X_i \hat{\theta}) \right] = 0$$

It follows that:

$$\left[\sum_{i=1}^N Z_i' X_i \right]' .C. \left[\sum_{i=1}^N Z_i' y_i \right] = \left[\sum_{i=1}^N Z_i' X_i \right]' .C. \left[\sum_{i=1}^N Z_i' X_i \hat{\theta} \right]$$

Hence the solution:

$$\hat{\theta} = \left(\left[\sum_{i=1}^N Z_i' X_i \right]' .C. \left[\sum_{i=1}^N Z_i' X_i \right] \right)^{-1} \left[\sum_{i=1}^N Z_i' X_i \right]' .C. \left[\sum_{i=1}^N Z_i' y_i \right]$$

Writing the above in matrix form:

$$\hat{\theta}^{GMM} = ((Z'X)' .C. Z'X)^{-1} (Z'X)' .C. Z'y$$

Or simply:

$$\hat{\theta}^{GMM} = (X'Z) .C. (Z'X)^{-1} X'Z .C. Z'y$$

Which is the conditionality function for the GMM estimator. Now that we have described how the estimator works, we now explain how the concept of GMM works in a dynamic panel data framework.

Consider the following example of a dynamic panel data model:

$$y_{it} = \alpha y_{it-1} + \beta x_{it} + \mu_i + \varepsilon_{it} \quad i = 1, \dots, N; t = 1, \dots, T.$$

Again we assume that we have a typical micro data where N is much larger relative to T . μ_i is the fixed effects elements. Whilst in a static panel, the main issue is whether the fixed effects are correlated with the regressors or not, in a dynamic panel mode the fixed effects are always correlated with lagged dependent variable. To see this it suffices to write

$$y_{it-1} = \alpha y_{it-2} + \beta x_{it-1} + \mu_i + \varepsilon_{it-1}$$

In the above, eliminating the fixed effects via the within transformation cannot solve the problem of correlation, GMM can be used to deliver consistent estimators of the model parameters instead. The Within transformation yields the following model

$$(y_{it} - \bar{y}_i) = \alpha(y_{it-1} - \bar{y}_{i,-1}) + \beta(x_{it} - \bar{x}_i) + (\varepsilon_{it} - \bar{\varepsilon}_i)$$

Where; $\bar{y}_i = \frac{1}{T} \sum_{t=1}^T y_{it}$; $\bar{y}_{i,-1} = \frac{1}{T} \sum_{t=1}^T y_{it-1}$; $\bar{x}_i = \frac{1}{T} \sum_{t=1}^T x_{it}$; $\bar{\varepsilon}_i = \frac{1}{T} \sum_{t=1}^T \varepsilon_{it}$ are the time averages. Although the within transformation has eliminated the fixed effects, we still have endogeneity problem because

$$\text{Cov}\{(y_{it-1} - \bar{y}_{i,-1}), (\varepsilon_{it} - \bar{\varepsilon}_i)\} \neq 0$$

Given that within estimator is not consistent, we need a different estimation strategy to obtain consistent estimators of the model parameters.

The first step is to first-difference the model as

$$(y_{it} - y_{it-1}) = \alpha(y_{it-1} - y_{it-2}) + \beta(x_{it} - x_{it-1}) + (\varepsilon_{it} - \varepsilon_{it-1})$$

$$\Delta y_{it} = \alpha \Delta y_{it-1} + \beta \Delta x_{it} + \Delta \varepsilon_{it}$$

As long as the assumption of no serial correlation in the error terms of the original model is valid, values of the dependent variable lagged by two or more periods (data permitting) can be used as instruments for the endogenous regressor. That is $y_{it-2}, y_{it-3}, \dots$ can be used as instruments for Δy_{it-1} . These are valid instruments because:

$$E(\varepsilon_{it}\varepsilon_{is}|X_i, \mu_i) = 0, t \neq s \rightarrow Cov\{y_{it-k}, \Delta \varepsilon_{it}\} = 0, \text{ For } k = 2, 3, \dots$$

Note that the first-difference error term follows a MA (1) (i.e. moving average integrated of order 1).

$$\Delta \varepsilon_{i2} = \varepsilon_{i2} - \varepsilon_{i1}$$

$$\Delta \varepsilon_{i3} = \varepsilon_{i3} - \varepsilon_{i2}$$

$$\Delta \varepsilon_{i4} = \varepsilon_{i4} - \varepsilon_{i3}$$

Fortunately, GMM can easily accommodate this serial correlation.

In order to assess the validity of the instruments used, we use the following tests: Arellano-Bond, Sargan and the Hansen test. This is equivalent to testing the model specifications.

For the purpose of this study we will be using the SGMM approach. This technique uses lagged first differenced values of endogenous regressors as instruments for the level equation (i.e. the original model) in addition to lagged levels as instruments for the differenced equation.

Final comments

We use a range of econometric techniques to estimate our Difference-in-Difference model, these are: FE, RE and system GMM approach. A full description of these models is provided in our technical appendix. Blundell and Bond (1998) propose a system GMM estimator for a situation of highly persistent data (i.e. the coefficient on the lagged dependent variable is close to 1). Using our test for serial correlation³⁵, we find the employment data to be highly persistent over time. In such instance, a dynamic econometric model specification should be preferred to a static specification³⁶. We use both the FE model³⁷ and the system GMM approach to estimate our dynamic model. Employing this estimator, the results indicate that.

³⁵ Wooldridge Test for autocorrelation in panel data.

³⁶ Steiner (2011), Egger and Pfaffermayr (2004) and Doel and Kiviet (1995) argue that the neglect of dynamics is a special case of omitted variable problem which leads to bias. Theoretical studies consistently show that the results of static models might be biased when the true model is dynamic.

³⁷ The presence of both lagged dependent variables and fixed effects causes a well-known bias (Nickell, 1981). But as our sample contains a relatively large number of time periods and only a moderate number of regions, using panel data techniques with fixed effects remains preferable to Generalised Method of Moments (GMM). That is because the lagged dependent variable bias declines as the number of time period increases, and our estimates will be consistent as long as there is no autocorrelation of the error terms.

SENSITIVITY ANALYSIS OF 1994 DEREGULATION ANALYSIS

To ensure that our econometric models are credible, we have run a wide range of model specification tests. Furthermore, we also conducted sensitivity analysis by changing the sample period. Overall, we find the coefficient estimates to be very stable.

Sample period

The first sensitivity checks the robustness of the results to changing the sample period. It can be seen that the size of the coefficients is fairly stable across the different model runs.

Dynamic model (FE)						
Independent variable	[1991-2000]	[1991-1999]	[1991-1998]	[1991-2001]	[1991-2002]	[1991-2003]
Sunday trading	-0.0195***	-0.0038	-0.0141*	-0.0271***	-0.0377***	-0.0312***

Start of Regulation Dummy

In the main analysis, we assume that the effects of the 1994 Sunday trading deregulation came into effect in 1995, as it was implemented on the 24 August 1994. We test the sensitivity of this assumption by using a dummy variable starting in 1994 instead. The results are given below for different sample periods. It can be seen that the do not change significantly.

Dynamic model (FE)						
Independent variable	[1991-2000]	[1991-1999]	[1991-1998]	[1991-2001]	[1991-2002]	[1991-2003]
Sunday trading	-0.0152*	0.0004	-0.0115	-0.0217***	-0.0310***	-0.0252***

**Europe, Middle East,
and Africa:****Global headquarters**

Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK
Tel: +44 (0)1865 268900

London

Broadwall House
21 Broadwall
London, SE1 9PL
UK
Tel: +44 (0)20 7803 1418

Belfast

Lagan House Sackville Street
Lisburn
County Down, BT27 4AB
UK
Tel: + 44 (0)2892 635400

Paarl

12 Cecilia Street
Paarl 7646
South Africa
Tel: +27(0)21 863-6200

Frankfurt

Mainzer Landstraße 41
60329 Frankfurt am Main
Germany
Tel: +49 69 95 925 280

Paris

25 rue Tiphaine
75015 Paris
France
Tel: +33 (0)1 56 53 98 52

Milan

Via Cadorna 3
20080 Albairate (MI)
Italy
Tel: +39 02 9406 1054

Americas:**New York**

5 Hanover Square, 19th Floor
New York, NY 10004
USA
Tel: +1 (646) 786 1879

Philadelphia

303 West Lancaster Avenue
Suite 2e
Wayne, PA 19087
USA
Tel: +1 (610) 995 9600

Mexico City

Emerson 150, Despacho 802
Col. Polanco, Miguel Hidalgo
México D.F., C.P. 11560
Tel: +52 (55) 52503252

Boston

51 Sawyer Road
Building 2 - Suite 220
Waltham, MA 02453
USA
Tel: +1 (617) 206 6112

Chicago

980 N. Michigan Avenue,
Suite 1412 Chicago
Illinois, IL 60611
USA
Tel: +1 (773) 372-5762

Miami

1090 Oysterwood Street
Hollywood, FL 33019
USA
Tel: +1 (954) 815 0305

Asia Pacific:**Singapore**

Singapore Land Tower
37th Floor
50 Raffles Place
Singapore 048623
Tel: +65 6829 7198

Sydney

Level 4, 95 Pitt Street
Sydney, 2000
Australia
Tel: +61 (0)2 8249 8286

Email:

mailbox@oxfordeconomics.com

Website:

www.oxfordeconomics.com