

Firm Response to a Labour Demand Shock
The 2010 Winter Olympic Games in Whistler BC

Tori Williamson
University of Victoria, Canada

April 2014

A Thesis Submitted in Partial Fulfillment of the Requirements for the Honours Degree of
Bachelor of Science in the Department of Economics

Supervised by: Dr. Herbert Schuetze

I would like to gratefully acknowledge Dr. Herbert Schuetze and Dr. Pascal Courty for everything that they have taught me this year. Thank you to my fellow 2013 Economics Honours students for their feedback and inspiration and to my friends and family for their support and encouragement.

Abstract

Using firm-level panel data from Whistler B.C. this paper explores the firm response to a labour demand shock from the 2010 Winter Olympic Games. Firms in the food and accommodation sector responded to the increase in output demand by increasing full time employment in the period 2009-2010 and increasing part time employment and part time hours in 2010. There is no evidence of sustained increase in employment levels following the Olympic Games.

Keywords: labour adjustment, demand shock, firm response

1 Introduction

How do firms respond to a labour demand shock? Firms in Whistler, British Columbia saw an increase in output demand during the 2010 Winter Olympic Games. To respond to this change in output, firms must adjust their levels of factors of production. This paper examines how labour, as a factor of production, changed for the 2010 Olympic Games. There are many ways to adjust quantity of labour. Firms might increase the number of employees or increase the number of hours worked. Alternatively, the firms might fail to respond to the shock and observe employee shortages. Different industries will be more inclined towards different responses due to the nature of the output demanded and structural differences across sectors. The insight gathered here will add to the existing knowledge of firm behaviour and labour demand. With the Olympic Games as the shock, the results will be helpful for future decisions regarding large scale sporting events.

In response to this event I find that firms in the food and accommodation sector adjust full time employment leading up the Olympic Games and adjust part time employment and part time hours during the Olympic Games. Firms that adjusted full time employment levels needed time to search, hire and train full time employees so the adjustment period includes 2009. Part time employment can be more easily adjusted on short notice so adjustment occur in 2010. As output demand increased, firms could increase average part time hours of existing employees or hire new part time employees at a much lower cost and commitment level than hiring full time employees. Some firms did not adjust employment levels enough. There is an increase in the probability of a firm experiencing an employee shortage in 2010. It is also possible that wage levels were adjusted in this period. Unfortunately, information on wages is not available and for the purpose of this paper wages will be assumed to be fixed. To determine these results I gather information on employment levels in Whistler, categorize the firms by sector and then perform difference estimates with this data. The information on firm response was acquired through an annual voluntary survey conducted of all businesses

in Whistler from 2006 to 2013 with the shock year, 2010, in the middle. The survey is concerned with Whistler's affordable housing needs, but also includes information on full time employees, part time employees, average hours, and employee shortages. These employment variables will be used here. The difference estimates of this data determine the magnitude of firm response. Each firm has been categorized according to the North American Industry Classification System (NAICS). Using this classification, I will analyze the firm responses by sector. The food and accommodation sector is the most likely to be affected by the influx of volunteers, media, athletes, and coordinators that are required to produce the Olympic Games. The time span of the data makes it possible to determine how long the duration of the shock is. The changes in employment levels will be assessed in the lead up to the Olympic Games by comparing the pre-Olympic employment levels, during the Olympic Games by comparing 2010 to all non-Olympic years, and following the Olympic Games by comparing pre- versus post- Olympic games employment levels. There is an expectation when choosing to invest billions of dollars into a large sporting event like the Olympic Games or the football World Cup, that the area will continue to benefit after the event is over. This long run increase in employment is not evident in this data.

The impact of shocks in labour economics can be viewed in terms of aggregates or individual responses, in other words, from a macroeconomic or microeconomic viewpoint. Bartik (2014) uses the following aggregates: labour market participation rates, unemployment rates and real wage rates, to compare the effects of local labour demand shocks in areas with different labour market conditions. The employment impact of the 1996 Georgia Summer Olympics was calculated using Difference-in-Difference estimates and unemployment insurance data (Hotchkiss et al., 2003). This aggregate work shows that there is a response from firms but does not investigate how this response is carried out. One example of firm level response is Dhyne and Druant (2010), who investigate how firms in Belgium react differently to cost or labour demand shocks compared to other European countries. They find that the structural restrictions on employee hiring and firing legislation, in other words, the ease with which

firms can increase or decrease the number of employees, in Belgium results in more flexible permanent employee levels compared to other European countries where job protection is more prevalent. This paper uses micro-level analysis to analyze how different firms and industries respond to a labour demand shock.

2 Shock Responses

Existing literature on labour shocks can be divided into two categories: microeconomic studies of firm-level responses to unspecified shocks and macroeconomic studies of aggregate responses to specified shocks. Here, I will bridge these two by looking at firm-level response to a specified shock. The macroeconomic analysis of large scale sporting events has found varying results for employment impacts. Most of the research is carried out *ex ante* to quantify the benefits that will hopefully outweigh the costs of hosting these events (Kasimati, 2003). The *ex poste* studies are the ones that look at the impacts on employment of these events after they have occurred. Hotchkiss et al. (2003) compare employment levels in venue and non-venue counties for the 1996 Summer Olympic Games in Atlanta, Georgia Jasmand and Maennig (2008) compare income and employment effects for the 1972 Summer Olympic Games in Munich, Germany and find increases in income and employment in tourism sectors in venue regions. The difficulties with quantifying employment effects and economic impacts for Olympic Games and large scale sporting events are outlined in Baade and Matheson (2002). Often, cities compete for hosting rights to a point where the costs outweigh the benefits.

The analysis of the 1996 Georgia Summer Olympics clearly identifies employment increases as one of the primary benefits to hosting the Olympic Games (Hotchkiss et al., 2003). To asses the *ex poste* impact Hotchkiss et al. (2003) use Difference-in-Difference estimations for aggregate employment levels between venue counties and non-venue counties. They find that overall employment levels in venue counties increased by 17% for the Olympic Games. In

accordance with the hope that investment in infrastructure for the Games has an influence in the long run there is a 0.002 percentage point per quarter increase in employment for venue counties versus non-venue counties for the post- versus pre- Olympics periods. Instead of looking at aggregate employment levels like in Georgia, the Whistler data uses firm-level employment levels. Unfortunately there is no available source for a difference-in-difference estimation and only one difference will be looked at.

Dhyne and Druant (2010) use firm-level data on employment levels for Belgium and other European countries to determine response to cost and demand shocks. They observe that Belgian companies adjust costs through employment levels 37% of the time, whereas the average European country adjusts employment levels 27% of the time. This is due to less stringent legislation in Belgium for protection against dismissals. The shocks are an increase in the cost of intermediate inputs, a rise in in labour costs, and a negative demand shock. In contrast the 2010 Whistler Olympic Games is a positive demand shock. The type of shock influences the firm response, and as the results of this paper show, the structural elements of the economy and employment flexibility will in turn structure a firms available responses.

Caballero et al. (1995) use the substitution between number of employees and hours per employee and the deviations between actual and desired employment to investigate the behaviour of a firm's employment mix. In response to shocks, employment adjustments are non linear with firms employment adjustment either large or nil and proportionately more response to large shocks than small. Shocks are more attributed to job destruction than creation so the impact is skewed. This variety of response to shocks is also evident in Whistler in 2010 for the Olympic Games.

From these studies, information on the economic impact of large scale sporting events and the adjustments made by firms in response to shocks can be drawn. The elements of firm level response and specific shock events are combined to determine firm response to the 2010 Winter Olympic Games.

3 Firm Response

The source of the output demand shock, and thus the labour demand shock, is the 2010 Winter Olympic Games in Whistler and Vancouver B.C. This shock effects the food and accommodation sector the most in this study. Firms that respond to the demand increase adjust their employment levels in terms of full time employment, part time employment and average part time hours. Each of these adjustments has different costs and restrictions. The magnitude and duration of the shock influence firm response.

Preparation for the Vancouver Olympic Games was kicked into high gear in 2003 when Vancouver won the bid to host the 2010 Olympic Games. Portions of the Games including downhill skiing, sliding sports, nordic events, ski jumping and the entirety of the 2010 Paralympic Games were hosted in Whistler. The building of Olympic venues (primarily the Athletes Village, Sliding Centre, Callaghan Nordic Park and Olympic Plaza) took many years. At this time there was also extensive construction on the Sea to Sky Highway linking Vancouver and Whistler. The 2010 Olympic Games shock to the economy was anticipated and in some sectors the increase in activity occurred over a multi-year period. The intensity of activity and influx of people for the actual games was such that the shock can be justified. An entire neighbourhood was established to host the competing athletes. The Vancouver Olympic Committee had a team of 22 000 volunteers to assist with the Olympic and Paralympic Games. The entirety of the 2010 Paralympic Games were held in Whistler. Thousands of volunteers were brought in. Media from across the globe had to be stationed not only for the Olympics but also the Paralympic Games which followed one month after.

Different sectors would experience the shock differently and be able to respond to the shock differently. Not all businesses would see the same increase in demand for outputs. This shock would not effect the education sector whereas restaurants likely saw a higher than average demand. For this reason education is the base sector in the regression analysis. The anticipation of this increase lead some firms to make changes to their factor mix prior to

2010 in preparation. At equilibrium a firm chooses a factor mix of labour and capital for a certain output quantity. If the firm anticipates a change in output demand and would like to increase the amount of output produced they need to adjust their factor mix. This can be represented by an outward shift in the firms isoquant curve. The structural constraints in the form of factor adjustment costs and the ease of factor adjustment will determine how the factors are changed. We will assume capital to be fixed in the short term. However, given the anticipation of the Games, firms may have had the opportunity to adjust capital factors. Only labour adjustments will be explored here.

The quantity of labour demanded is determined by the marginal revenue product of labour. In the short run the quantity of labour demanded depends also upon the wage rate which in turn depends upon the labour supply. The data here does not include wage so we can not see how or if wages adjusted in response to the shock. Instead, the focus is on how quantity of labour is adjusted through part time employment, full time employment and employee hours. Wages are assumed to be fixed. In Figure 1 the outward shift in marginal revenue product of labour and subsequent change in quantity of labour can be seen.

The factor adjustment costs for labour can be divided into fixed and variable costs (Hamermesh, 1996). Fixed costs can be divided into recurring and one time. Examples of recurring fixed costs are health coverage and sick leave and one time fixed costs are training and hiring costs. Variable costs include wage, either hourly or salary, overtime and possibly payroll tax or pension. When a firm chooses to adjust their factors of production these costs must be taken into account. The costs associated with increasing the number of part time hours is likely to be less than increasing full time hours into overtime. The costs of increasing existing employee hours is much less than the costs of hiring and training an additional employee. The choice of which action to take depends upon the firms existing labour structure, the magnitude of factor adjustment they wish to make, and the associated costs with that adjustment.

Outward Shift of Marginal Revenue Product of Labour

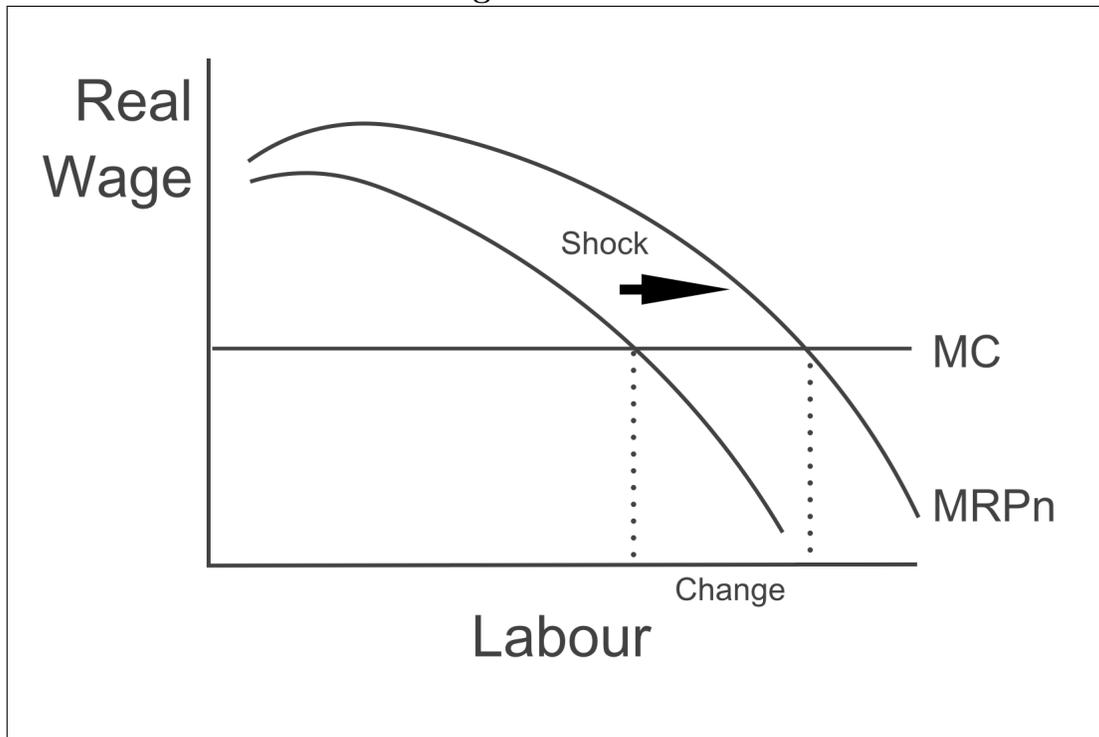


Figure 1: The outward shift of the Marginal Revenue Product of Labour (MRPn) curve is a result of the shock to output demand. With Marginal Cost (MC), the real wage, held constant, the shift in the MRPn curve causes a change in the quantity of labour demanded. How firms carry out this change is what will be explored further on.

The short time span of the Olympic Games does not necessarily justify the hiring of new employees, the generation of permanent full-time jobs and the sustainability of the employment effects. Rational agents will exhaust other alternatives such as asking existing employees to work overtime or perform other tasks, before hiring additional work force to satisfy the temporary high demand (Crompton, 1995). The municipal government in Whistler asked employees to perform other tasks through a redeployment program during the period. This meant they were able to adapt to the changes in output demand without making large changes to employment levels.

In the long run, capital and labour can both be adjusted. In the regression results there are no statistically significant long run changes in employment levels in the post-Olympics period compared to the pre-Olympics period. The infrastructure investments may have

had an impact but there are so many other influences on employment levels between these two periods. Without a control group to compare Whistler to, these impacts can not be estimated. Finding a control group has not been possible because the firm-level data is unique and Whistler itself is unique. Any other ski resort town in British Columbia does not face the same restrictions on expansion nor the same magnitude of demand. In 2013 Whistler's annual GDP was \$1.3 billion. The municipal government is one of only a few resort municipalities in British Columbia. As such, it is uniquely positioned to position Whistler as a resort destination. Without this control to compare employment levels the long run effects can not be confidently ascertained. The short run effects are likely to be biased.

Alternative sources for variation in output demand can effect employment levels. The Tourism Life Cycle laid out by Avdimiotis (2009) shows the progression over time that a tourist destination is likely to experience. Each stage of the cycle has implications for tourist flows, relationship between hosts and guests, the degree of change in the destination and the involvement of external stakeholders (Swarbrooke, 1999). The stages exploration, involvement, development, consolidation, stagnation, and rejuvenation or decline each have different labour implication for different industry sectors. These could all contribute bias to the employment adjustment estimates. Despite this bias the change in employment levels and scale of the Olympic Games as a shock justifies that there is an adjustment in employment even if the exact scale of that adjustment is not completely accurate.

4 Data

The firm-level panel data was obtained by the Whistler Housing Authority through a voluntary annual survey. The goal of this survey is to gain information on affordable housing in Whistler, BC. It is a small, expensive resort town with a limited number of bed units. The Whistler Housing Authority is concerned with making it possible for people to live and work

in Whistler. The restrictions on expansion in Whistler are one of the ways it is unique. The uniqueness of this mountain resort town not only make this study special but also restricted it in its estimation of employment adjustments. There is no control group available with which to compare employment levels precisely because the town strives to differentiate itself from its competitors. By having access to firm-level data across time it is possible to see how firms respond to the labour demand shock.

There are multiple employment variables available through the survey. As well as employee housing questions, the survey also asks a variety of questions on employment levels. The questions vary each year, and from the eight years of data that are available (2006-2013) there are eighty-eight different questions asked. This has been narrowed to eight variables of interest: number of part time employees, number of full time employees, average part time hours, total full time equivalent employees, full time employee shortage, part time employee shortage, part time full time equivalent shortage and total full time equivalent shortage. A full time equivalent (FTE) employee is either a full time employee or a combination of the part time employees and the average number of part time hours that would result in one full time employee, usually forty hours. For example, four part time employees working ten hours per week would equal one full time equivalent employee. The results show full time employment, part time employment, average part time hours and full time equivalent employment adjustments.

Each of the 610 firms sampled has been classified according to the North American Industry Classification System (NAICS). There are different levels of classification in this system. The firms have been classified into two digits of classification with the exception of the food and accommodation sector. This sector contains firms that are most likely to be influenced by the labour demand shock from the Olympic Games. For this reason this sector has been further classified to the five digit level. In total there are twenty two sectors of classification within the data sample.

To get an idea of the changes over time, Figure 2 shows the mean values for each variable across the sample period. There is a notable bump for total full time equivalent employees, full time employees, full time equivalent employees and total full time equivalent shortages. This increase is what will be shown in the short run impacts regression. The lead up to the games can also be seen in a gradual increase in 2008 and 2009. This will be explored in the pre- games regression. Finally, the pre- and post- Olympic Games employment levels will be compared to determine long run effects.

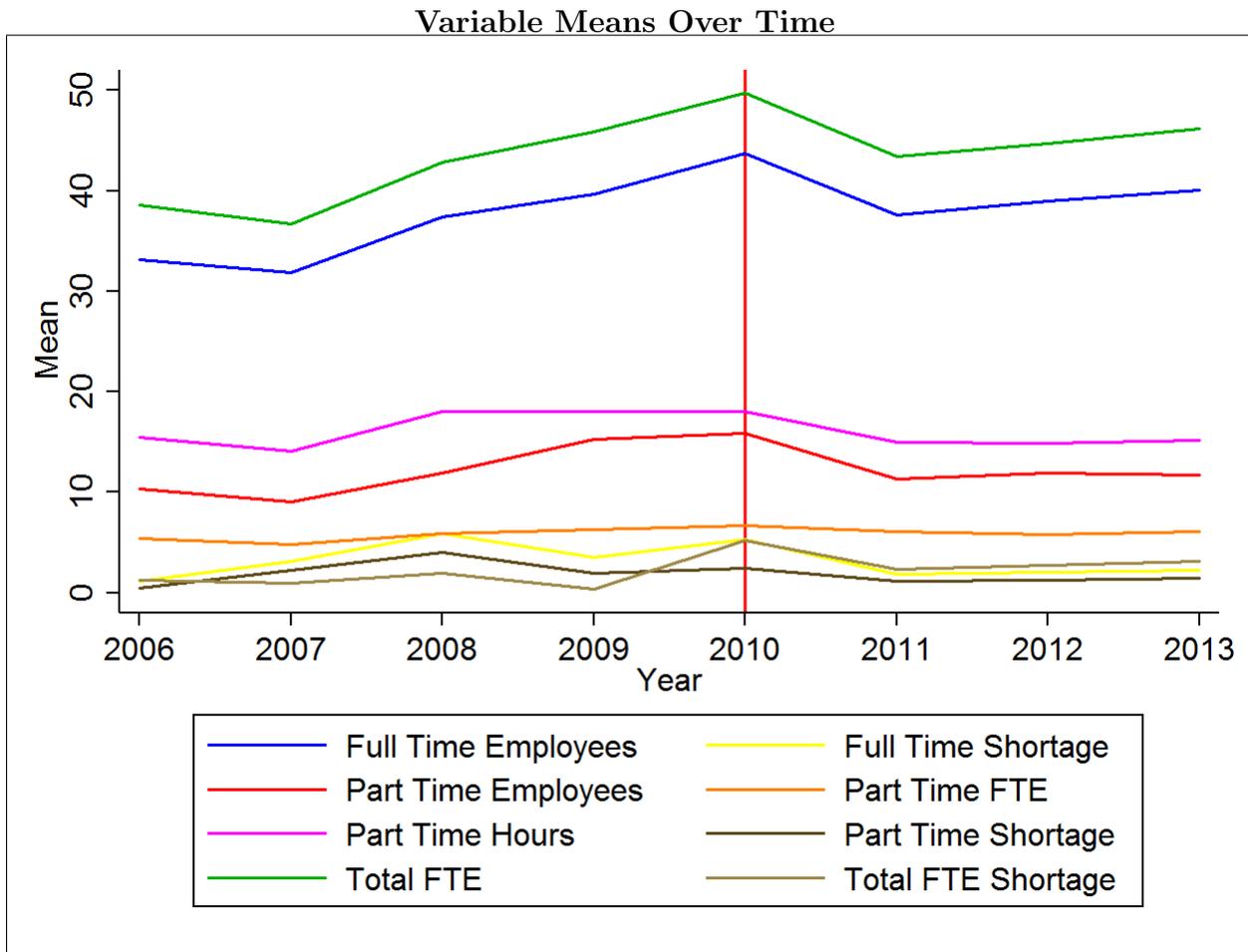


Figure 2: Mean values for each variable plotted from 2006 to 2013. The increase in full time employees can be seen in 2009 leading up to the game. The peaks in 2010 illustrate the shock and increase in labour demand.

5 Employment Adjustments

The multiple regressions used here explore before, during and after changes in employment levels for the 2010 Olympic Games use log dependent variables and sector, interest year and interaction dummy variables to estimate the changes in employment levels. Each regression that involves sectoral comparisons uses education as the base sector on the assumption that employment levels in the education sector are not adjusted for the Olympic Games. The control variables are firm size and British Columbia provincial GDP as an indicator of the general economic climate.

First we estimate the changes in our variables of interest in 2010 across all sectors. To investigate the presence of changes in employment levels across all sectors Equation 1 contains a dummy variable for 2010. The left hand side dependent variable is the log of the employment variable, in the example part time hours, then the year of interest, 2010, the firm size and provincial GDP control variables and the error term.

$$\ln pthours_i = \beta_1 + \beta_2 2010 + \beta_3' X_i + \varepsilon_i \quad (1)$$

Change in Employment Levels in 2010 for all Sectors				
Regressor	Full Time Employees	Part Time Employees	Part Time Hours	Total Full Time Equivalent
Intercept	1.753*** (0.000)	1.330*** (0.000)	2.953*** (0.000)	2.067*** (0.000)
2010 Dummy	0.082 (0.255)	0.063 (0.454)	0.033 (0.398)	0.169** (0.013)
Adjusted R ²	0.5386	0.4117	0.0731	0.5643
Observations	1784	1319	1331	1816

Table 1: There is no statistically significant change in employment levels of full time employees, part time employees or part time hours. There is a statistically significant increase in total full time equivalent employment of 17% in 2010 at the 5% significance level. *Significant at 90% confidence level, **significant at 95% confidence level, ***significant at 99% confidence level. P-values shown in brackets.

Each of the eight variables of interest are estimated. In Table 1 the only variable with a

statistically significant change across all firms is total full time equivalent. Total full time equivalent employment increased by 17% across all sectors. One full time equivalent employee can be either one full time employee or a combination of part time employees and average part time hours that is the equivalent to a full time employee in terms of hours worked per week. This variable is a combination of the number of part time employees and the average hours worked. The fact that neither the number of part time employees nor the average part time hours have statistically significant increases likely means that individually their changes were not significant but together they were. Full time employment, part time employment and part time hours all have positive coefficients but they are not statistically significant. Changes in employment levels for all firms is only statistically significant for adjustments in full time equivalent employees.

Next we look at how the different sectors respond to the labour demand shock in 2010. By separating the firms by sector, the differences in shock impacts between sectors and factor adjustment capabilities can come through in the results. The North American Industry Classification System (NAICS) has different levels of divisions for sectors. The majority of the sample has been classified to two decimal points. The food and accommodation sector, however, has been classified to five decimal points. This is the sector most likely to observe changes in output demand and adjust employment levels in response to the output demand shock. The large volume of visitors and staff for the 2010 Olympic Games increase the demand for accommodation, food, and beverage services.

Different sectors are likely be affected differently because of the the nature of the shock and because of the nature of each sector. Some sectors are likely to not be affected by the shock. One of these sectors is education, which is why it will be used as the base sector for the sectoral comparisons. This sector should not be effected by the Olympic Games, therefore the differences in the regressions can more likely be attributed to the Olympic Games. There structures of the different sectors will also shape the form of firm response. Sectors like the hotel sector face capacity restraints in the number of rooms they are able to occupy. This

can not be adjusted to an increase in output demand. Food and beverage sectors are more able to increase output through increased labour.

Equation 2 contains the log of the employment variable as the left hand side dependent variable, in the example part time hours, a dummy variable for each NAICS sector, with Education as the base sector, the year of interest, 2010, the interaction of each sector with the year 2010, the firm size and provincial GDP control variables and the error term. The variable that is focused on is the sector*2010 interaction. This will show changes in each sector in the shock year, 2010, against all non-Olympic games years.

$$\ln pthours_i = \beta_1 + \beta_2 sector_i + \beta_3 2010 + \beta_4 sector_i 2010 + \beta_5' X_i + \varepsilon_i \quad (2)$$

Short Run Impacts on Select Sectors			
Regressor	Full Time Employees	Part Time Employees	Part Time Hours
Intercept	1.745*** (0.000)	1.297*** (0.000)	2.967*** (0.000)
2010	0.115 (0.839)	0.122 (0.669)	0.060 (0.760)
Bars*2010	1.183 (0.205)	1.554* (0.079)	0.552 (0.197)
Bed and Breakfasts*2010	-	-1.337 (0.146)	1.322*** (0.004)
Caterers*2010	3.053*** (0.001)	-	-
Restaurants*2010	0.181 (0.447)	0.607** (0.012)	0.071 (0.543)
Information*2010	0.121 (0.825)	0.467 (0.460)	-0.559* (0.067)
Adjusted R	0.5518	0.4779	0.0966
Observations	1784	1319	1331

Table 2: Bars increased the number of part time employees by 155% in 2010. Bed and Breakfasts increased average part time hours by 132% in 2010. Caterers increased number of full time employees by 305% in 2010. Restaurants increased the number of part time employees by 61% in 2010. The information sector decreased average part time hours by 56% in 2010. *Significant at 90% confidence level, **significant at 95% confidence level, ***significant at 99% confidence level. P-values shown in brackets.

The sub sectors of the food and accommodation sector bars, bed and breakfasts, caterers, and restaurants had statistically significant increases in employment levels in 2010. In the year of the Olympic Games bars increased the number of part time employees by 155%, bed and breakfasts increased average part time hours by 132%, caterers increased number of full time employees by 305% in 2010, and restaurants increased the number of part time employees by 61% in 2010. These increases are relative to the base sector education for which any change is not attributed to the Olympic Games. The only sector to increase full time employment levels, caterers, did so due to large contracts for the Olympic Games. This justified the higher cost of increase full time employment levels. The other sectors adjusted part time employment for two reasons. Either because it is less costly and the change in output demanded did not justify changes in full time employment level, or the time required to find and train a full time employee is higher. The information sector, which includes newspapers, television and libraries decreased average part time hours in 2010. This could be due to crowding out as normal operations decreased in favour of Olympic focused operations.

The sectors and firms that did not experience statistically significant changes in employment levels in 2010 could have either not anticipated the change in output demand accurately or been constrained by costs or availability of employees. This leads to an increase in the likelihood of experiencing an employee shortage in 2010. The Whistler Housing Authority Employer Needs Survey includes questions on employment shortages. The questions ask about full time shortages, part time shortages, and total full time equivalent shortages. The majority of firms responded to the total full time equivalent shortage as it is difficult to ascertain the exact nature of an employee shortage. Knowledge of a shortage in employees can be certain, but whether full time or part time employees were needed is more difficult to say. If employers experienced a shortage the variable for shortage takes a value of 1, if not it takes a value of 0. Equation 3 is a linear probability model with shortages as the dependent

variable and the shock year 2010 as the variable of interest.

$$shortage = \beta_1 + \beta_2 2010 + \beta_3' X_i + \varepsilon_i \quad (3)$$

Employee Shortage in 2010

Regressor	Shortage
Intercept	0.827*** (0.000)
2010	0.173* (0.088)
Adjusted R ²	0.2107
Observations	1054

Table 3: In 2010 firms were 17% more likely to experience employee shortages at the 90% confidence level. *Significant at 90% confidence level, **significant at 95% confidence level, ***significant at 99% confidence level. P-values shown in brackets.

The likelihood of a firm experiencing an employee shortage is 17% higher in 2010. Structural limitations on available employment, like availability of experienced labour, may be a reason for this. Alternatively, firms may not have calculated the magnitude of the increase in output demand accurately. The increase in the probability of experiencing a shortage supports the presence of an increase in output demand and from this an increase in labour demand for the Olympic Games in 2010.

The changes in employment levels could also include the period leading up the Olympics. The increase in employment levels in 2009 as well as in 2010 can be seen in Figure 2. To assess the lead up to the games, with the idea that firms anticipated the coming Olympics and started adjusting labour levels prior to 2010, 2009 is included with 2010 as the shock variable and this time period is compared to the pre-Olympic years 2006-2008.

In Equation 4 the log of the employment variable is the dependent variable and the time period shock is expanded to include the year 2009 as well as 2010. This variable is interacted with each sector to determine the employment changes by sector pre-Olympics versus 2009

and 2010. Controls for firm size and provincial GDP are included.

$$\ln p_{hours_i} = \beta_1 + \beta_2 sector_i + \beta_3 2009\&2010 + \beta_4 sector_i 2009\&2010 + \beta_5' X_i + \varepsilon_i \quad (4)$$

Employment Changes in Select Sectors for 2006-2008 and 2009-2010

Regression	Full Time Employees	Part Time Employees	Part Time Hours
Intercept	1.035*** (0.000)	4.497** (0.011)	3.812*** (0.000)
2009 & 2010	-0.893 (0.110)	0.118 (0.854)	0.221 (0.441)
Bar*2009&2010	1.732** (0.037)	0.247 (0.778)	-0.377 (0.336)
Cafe*2009&2010	1.069* (0.078)	-0.062 (0.928)	-0.261 (0.396)
Caterer*2009&2010	2.246** (0.015)	0.686 (0.547)	-0.166** (0.012)
Adjusted R2	0.5424	0.4924	0.1073
Observations	1205	866	870

Table 4: In the lead up to the Olympic Games period 2009-2010 compared to the pre-Olympics period 2006-2008 bars increased full time employees by 173%. Cafes increased full time employees by 107%. Caterers increased full time employees by 225% and decreased average part time hours by 16%. *Significant at 90% confidence level, **significant at 95% confidence level,***significant at 99% confidence level. P-values shown in brackets.

Including 2009 in the time period of interest, based upon firms anticipating the increase in output demand for the Olympic Games and preparing for it, there is an increase in full time employees compared to the pre-Olympic period of 2006-2008. Bars increased full time employees by 173%. Cafes increased full time employees by 107%. Caterers increased full time employees by 224% and decreased average part time hours by 16%. The increases in full time employment for bars and cafes are interesting because they did not show up in the 2010 estimates in Table 2. This suggests that firms may have required more time to hire and train full time employees and did so in 2009. The Olympic Games were hosted early in the year, in February. The higher time costs associated with searching, hiring and training a full time employee means that these increases were done prior to 2010. For the catering sector

the 305% increase in 2010 compared to the 225% increase in 2009 & 2010 suggests that the majority of the change in employment levels occurred in 2010. Given that contracts have a set time period this is understandable. The decrease in average part time hours could be due to the increase in full time employees.

To determine if the changes in employment levels extended beyond 2010, which is identified as one of the benefits of hosting the Olympic Games, the employment levels for the pre-Olympic period of 2006-2008 are compared to the post-Olympic employment levels for 2011-2013. The years 2009 and 2010 are excluded from this sample. In Equation 5 the log employment variables are the dependent variable, firms are divided into sectors and the time period of interest is Post 2010. This is interacted with each sector to determine if there are any long run effects on employment levels from the pre- to the post- Olympic Games time periods. Control variables include firm size and provincial GDP.

$$\ln p_{hours_i} = \beta_1 + \beta_2 sector_i + \beta_3 post2010 + \beta_4 sector_i post2010 + \beta_5' X_i + \varepsilon_i \quad (5)$$

The hoped for long term increases in employment levels following the 2010 Olympic Games are not evident in these results. Part time hours decreased by 22% in the arts and recreation sector, 300% in the bed and breakfasts sector, and 34% in the information sector in 2011-2013 compared to 2006-2008. These decreases indicate that long run employment levels did not increase. There is an increase of 48% in part time employees in the professional and technical sector. Considering this sector did not see statistically significant increases during the Olympic Games it is unlikely that this increase is related to the Olympic Games. These changes could be due to many other factors and can not be confidently attributed the Olympic Games in 2010. For example, the 2008 financial crisis is one of the many things that could influence these results.

There are multiple limitations with this available data for ascertaining the employment adjustments for the 2010 Olympic Games in Whistler B.C. Without a control group to

Employment Changes in Select Sectors for 2009 & 2010 versus Post-Games2011

Regression	Full Time Employees	Part Time Employees	Part Time Hours
Intercept	1.814*** (0.000)	1.375*** (0.000)	2.932*** (0.000)
Post 2010	0.236 (0.110)	0.058 (0.747)	-0.020 (0.820)
Arts and Recreation*Post 2010	0.040 (0.872)	0.357 (0.208)	-0.222* (0.085)
Bed and Breakfast*Post 2010	0.444 (0.450)	-1.732* (0.069)	-2.997*** (0.004)
Finance and Insurance*Post 2010	-0.079 (0.765)	0.476 (0.148)	0.332* (0.036)
Information*2010	0.262 (0.423)	0.162 (0.657)	-0.342* (0.048)
Professional and Technical*Post 2010	0.060 (0.771)	0.484** (0.042)	-0.118 (0.358)
Adjusted R	0.6308	0.4455	0.1073
Observations	1405	1046	1057

Table 5: The arts and recreation sector decreased average part time hours by 22% in the post-Olympics period compared to the pre-Olympics period. Bed and breakfasts decreased part time employees by 173% and average part time hours by 300%. The finance and insurance sector increased average part time hours by 33%. The information sector decreased average part time hours by 34%. the professional and technical sector increased part time employees by 48%. *Significant at 90% confidence level, **significant at 95% confidence level, ***significant at 99% confidence level. P-values shown in brackets.

compare firm action to, the changes shown here can not be entirely attributed to the 2010 Olympic Games. This limitation does not completely negate the results, it only suggests that the knowledge of a bias exists. A large amount of the employment increases that occurred for the Olympic Games do not show up on this data. Only local firms are surveyed so large corporations that were acting in Whistler at the time but based elsewhere are not included.

6 Conclusion

In summary, in the lead up to the games seen in Table 4 the food and accommodation sectors; bars, cafes, and caterers, increase full time employment. The time required to hire

and train full time employees suggests that these firms were preparing themselves for the increase in output demand in 2010 for the Olympic Games. In 2010, the food and accommodation sectors; bars, bed and breakfasts and restaurants, adjusted part time employment levels. Hiring part time employees requires less financial commitment from the employer and increasing average part time hours does not require any search or hiring costs. These adjustments can be more easily made in the short run as the magnitude of the shock can be more clearly forecasted closer to the hosting of the Olympic Games. Caterers increase full time employment significantly due to catering contracts. With the contracts the caterers could concretely forecast the increase in output demand and adjust employment levels appropriately. There is a 17% increase in the probability of a firm experiencing an employee shortage at this time. The firms experiencing these shortages either did not anticipate the shock accurately or were unable to meet their labour demands for structure reasons. Following the Olympic Games some sectors decreased average part time hours but there were no long run employment increases compared to the pre-Olympics employment levels. The food and accommodation sector adjusted employment levels the most for the Olympic Games. Some sub sectors adjusted full time employment leading up to the Games and some sub sectors adjusted part time employment during the Games.

The increase in output demand results in a labour demand shock in Whistler B.C. for the 2010 Winter Olympic Games. In response to this shock firms in certain sectors, primarily food and accommodation sectors, adjusted employment levels. Full time employment increases occurred in 2009 as well as 2010, as firms required time to hire and train full time employees for the Olympic Games in February. Part time employment increase occurred in 2010. Part time employment levels can be adjusted more quickly and at a lower cost. As the shock occurred firms could more accurately calculate the size of the output demand increase and quickly adjust part time employment accordingly. Long run adjustments in employment levels due to the Olympic Games are not evident in these results. The increase in probability of an employee shortage occurring in 2010 suggests that future hosts of large scale sporting

events could be better prepared. The presence of employment increases during the 2010 Olympic Games in Whistler B.C. supports the existing literature that large scale sporting events have employment benefits.

In response to the labour demand shock caused by the 2010 Olympic Games, firms adjusted full time employment in anticipation of the Games and part time employment during the Games. The increased likelihood of experiencing an employee shortage in 2010 suggests that all firms did not respond adequately to the shock or were not able to respond due to constraints. The effects of the Olympic Games beyond adjustment in labour for local firms are not observed here, but it is possible and likely that they extended to adjustments in wages, profits, and capital. From this study we can conclude that the costs, duration, and sectoral bias of a shock to labour demand influence firm response.

References

- Avdimiotis, S. (2009). From development to decline. tracing the life circle notifications of a destination. *Journal of Environmental Protection and Ecology*, 10(4):1205–1217.
- Baade, R. A. and Matheson, V. (2002). 6. bidding for the olympics: fool’s gold?. *Transatlantic sport: The comparative economics of North American and European sports*, page 127.
- Bartik, T. J. (2014). How effects of local labor demand shocks vary with local labor market conditions.
- Caballero, R. J., Engel, E. M., and Haltiwanger, J. (1995). Aggregate employment dynamics: Building from microeconomic evidence. Technical report, National Bureau of Economic Research.
- Crompton, J. L. (1995). Economic impact analysis of sports facilities and events: Eleven sources of misapplication. *Journal of sport management*, 9(1).
- Dhyne, E. and Druant, M. (2010). Wages, labor or prices: How do firms react to shocks? Technical report, National Bank of Belgium.
- Hamermesh, D. S. (1996). *Labor demand*. Princeton University Press.
- Hotchkiss, J. L., Moore, R. E., and Zobay, S. M. (2003). Impact of the 1996 summer olympic games on employment and wages in georgia. *Southern Economic Journal*, 69(3).
- Jasmand, S. and Maennig, W. (2008). Regional income and employment effects of the 1972 munich summer olympic games. *Regional Studies*, 42(7):991–1002.
- Kasimati, E. (2003). Economic aspects and the summer olympics: a review of related research. *International Journal of Tourism Research*, 5(6):433–444.
- Swarbrooke, J. (1999). *Sustainable tourism management*. Cabi.