Is Involuntary Part Time Employment the New Temporary Layoff?

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Abstract:

Those who are employed part time for economic reasons are oft thought of as individuals who are working at a local fast food establishment while waiting for something more suitable to come along. This notion is actually quite far from reality. Those who are employed part time for economic reasons are highly likely to be employed by the same employer and performing the same job description as they were prior to being placed on reduced hours and are highly likely to return to full time hours with the same employer and job description in the next month. In addition, the ratio of those employed part time for economic reasons to the civilian unemployment rate has been rising since the early 2000s, reaching a plateau of roughly 75 percent by mid 2014. These facts suggest a structural change in the U.S. economy that needs to be considered when examining the amount of slack in the labor market, and the implications thereof. This structural shift may be driven by the supply side, the demand side or both. I find that internet penetration, measured at the state level, has a strong impact on the likelihood that someone experiences part time employment for economic reasons. The internet has changed many things about the United States economy, and the structural shift with respect to part time employment for economic reasons is one of them.

I. Introduction

In times of slack demand, employers may utilize temporary layoffs amongst other methods to lessen their costs. Though the use of temporary layoff during times of economic downturn has declined systematically since the 1990s, the phenomenon of slack demand has not disappeared in that time. So, this begs the question of how employers are weathering episodes of slack demand? The use of hours reduction by firms is an alternate way to reduce costs in periods of slack demand and would be caught in measures of the labor force as workers who are employed part time for economic reasons.

The fraction of the labor force that is employed part time for economic reasons relative to the unemployment rate can be used to better understand the impacts on the economy of the use of hours reductions as opposed to outright layoff of workers. Figure 1 plots the ratio of those employed part time for economic reasons to the civilian unemployment rate from 1994 to 2018[1]. It is clear that even prior to the Great Recession that this relationship was on the rise. After the Great Recession the ratio continued to rise before seeming to plateau at a rate far higher than pre-recessionary norms.

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[1] The data is bounded at 1994 due to the necessity of survey questions that were introduced as part of the 1994 redesign of the Current Population.

Figure 1: The Ratio of Part Time for Economic Reasons to the Civilian Unemployment Rate
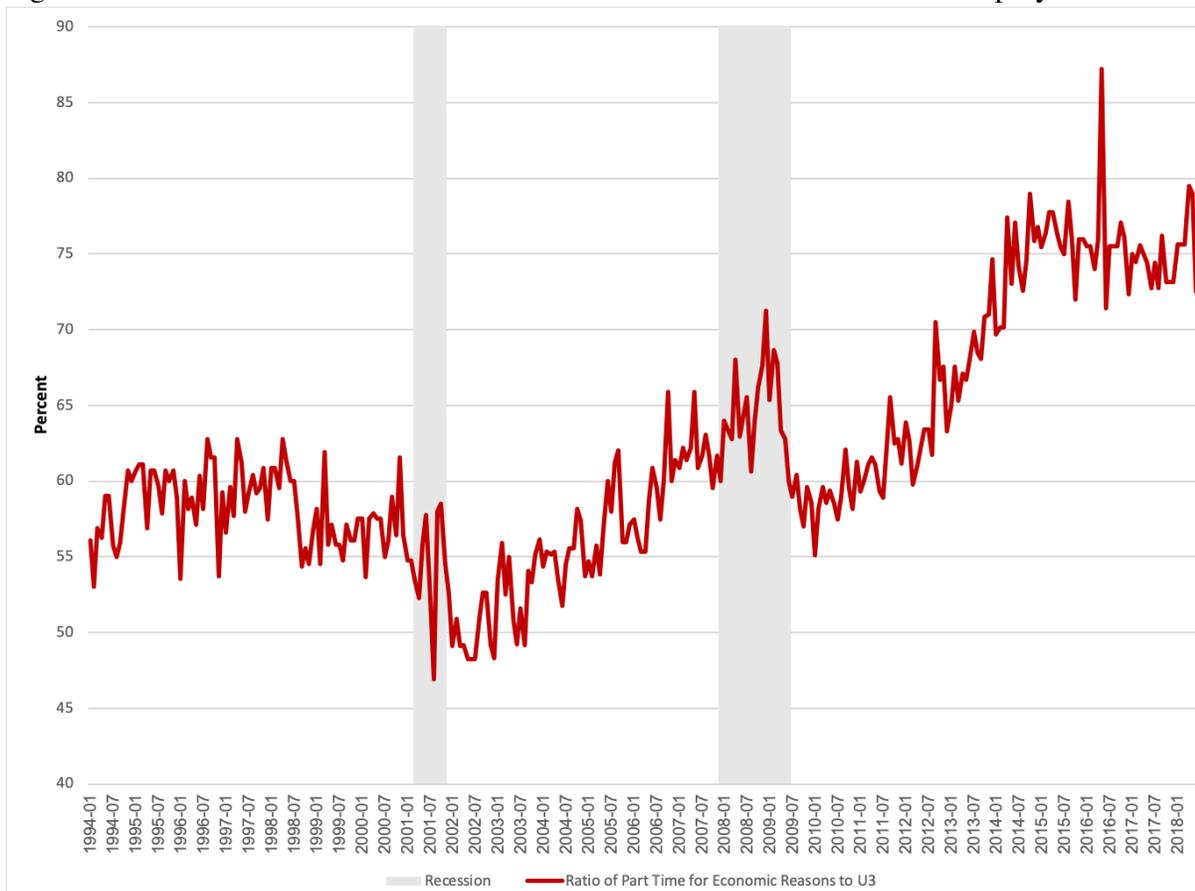
Note: Data comes from the Bureau of Labor Statistics and is Seasonally Adjusted. Recession dates come from the National Bureau of Economic Research

Many have examined the levels of different economic indicators to test whether the economy is returning or has returned to pre-recessionary trends (Canon et al. (2014); Valletta et al. (2013)). The general consensus is that the economy has returned to most pre-recession levels for common economic indicators. However, levels do not necessarily tell the whole story. The relative composition of the labor force with regards to unemployment and part time employment for economic reasons has clearly changed in the past two decades and does not show signs of reversion.

Those employed part time for economic reasons are likely to be in the service sector, undertaking front line jobs, have lower levels of education, and are younger on average than those who are employed part time for noneconomic reasons or who are employed full time (Canon et al. 2014). When examining those employed part time for economic reasons over time, it can be shown through a shift share analysis that the increased use of involuntary part time employment as a response to slack demand comes from within group variation, be those groups occupational, industry, or demographic in nature. Roughly 80 percent of the increase is accounted for by the industries and occupations where part time employment for economic reasons already is used. This increase in the use of hours reduction is not one that is across the board. The breakdowns of a shift share analysis for these specific industries can be found in the appendix. Industries were divided into 17 groups, occupations into 22 groups, and age into 7 ten-year age brackets, with those over the age of 70 being grouped together. Race was broken down into those who are white and those who are non-white, and sex into male and female. The comparison uses 2005 as the initial time period because that is when the increasing ratio of PTER to the civilian unemployment rate seems to begin. It is also true that during this time period, there was economic stability, and level economic indicators were at reasonably low levels. Although the level economic indicators in 2017 were also at reasonable levels, the ratio of PTER to the civilian unemployment rate was far higher, and more stable, than that of 2005.

Table 1: Shift-share Analysis Analyzing the Changes in the Use of Employment that is Part Time for Economic Reasons between 2005 and 2017

	All Industries	All Occupations	Age	Race	Gender
FORWARD SHARE					
Share within:	0.88	0.88	1.11	0.90	0.98
Share of shift:	0.04	0.03	-0.12	0.09	0.01
Interaction share	0.08	0.08	0.01	0.01	0.01
BACKWARD SHARE					
Share within:	0.96	0.97	1.12	0.91	0.99
Share of shift:	0.12	0.12	-0.11	0.10	0.02
Interaction share	-0.08	-0.08	-0.01	-0.01	-0.01

Source: Author's calculations using Current Population Survey Data

The major industries that contributed the most to the within impact are Accommodation and Food Service, and Retail Trade. These industries are notable because they are ones where periods of slack demand are not necessarily cyclical. Literature suggests that movements experienced by firms are minimally correlated with the business cycle (Davis and Haltiwanger 1990). These firm specific fluctuations are bigger events for managers than the business cycle.

II. Behavior of those Employed Part Time for Economic Reasons

The conventional notion of people who are employed part time for economic reasons is that they are individuals who are working jobs at fast food chains or other establishments that typically only employ part time workers while they search for a full-time position elsewhere. However, when investigating the behavior of those who are employed part time for economic reasons using the Current Population Survey from 1994 to 2018, those employed part time for economic reasons are highly likely to be employed by the same employer and doing the same job

description during their period of reduced hours as they were when employed full time. Additionally, those who are employed part time for economic reasons are highly likely to return to full employment with the same employed and the same job description as when they were working reduced hours. This supplants the conventional notion of workers who are employed part time for economic reasons.

Tables two and three show the labor force transitions into and out of part time employment for economic reasons. These findings demonstrate that employers are, to a high degree, utilizing hours reduction as a mechanism of reducing costs while retaining the employer-employee match. Employees who transition to short hours are highly likely to be doing so within the same firm and job description as when they were employed full time the month prior. Of those who transition from short hours to full time, the employees are highly likely to do so within the same employer and job description as they had been working in the month prior.

Table 2: Transitions to Part Time Employment for Economic Reasons	
	Percent
Of those who are employed part time for economic reasons this month, what percentage were:	
Non-employed last month	10%
Employed last month	90%
Employed (not PTER) last month	54%
PTER last month	36%
Of those employed (not PTER) last month and who are PTER this month, how many are employed with:	
Same employer as previous month	95%
Same employer and job description as previous month	88%
Different employer	5%

Source: Author's Calculations using the Current Population Survey

Table 3: Transitions from Part Time Employment for Economic Reasons	
	Percent
Of those who were employed part time for economic reasons last month, how many are:	
Non-employed this month	8%
Employed this month	92%
Employed (not PTER) this month	55%
Employed PTER this month	37%
If transitioning to employment that is not part time for economic reasons, is the transition to:	
Same employer as previous month	93%
Same employer and job description as previous month	86%
Different employer	6%

Source: Author's Calculations using the Current Population Survey

III. The Increased Use of Hours Reduction

There are a number of potential reasons why the use of part time employment for economic reasons has risen relative to the unemployment rate. One possible reason is that the United States economy has shifted in the past half century from being heavily manufacturing based to be a far more service-based economy. In the manufacturing industry it may be more reasonable to use temporary layoff as a firm shuts down a plant or assembly line during slack conditions due to the nature of the work. As manufacturing declined, the use of temporary layoff during periods of slack demand did as well. This phenomenon can be seen in figure three. During recessions prior to that of 1990-1991, the share of unemployment that came from temporary layoff rose sharply. In recessions from 1990 onward, this trend fails to be as strong. It is important to note that there is a gap in the timing of the decline in temporary layoff and the rise of part time employment for economic reasons. What is most likely going on is that manufacturing used temporary layoff and is shrinking and using it less. The service sector is growing and using part time employment for economic reasons more.

Figure 3: Comparison of Manufacturing Jobs as a Share of Employment to the Use of Temporary Layoff
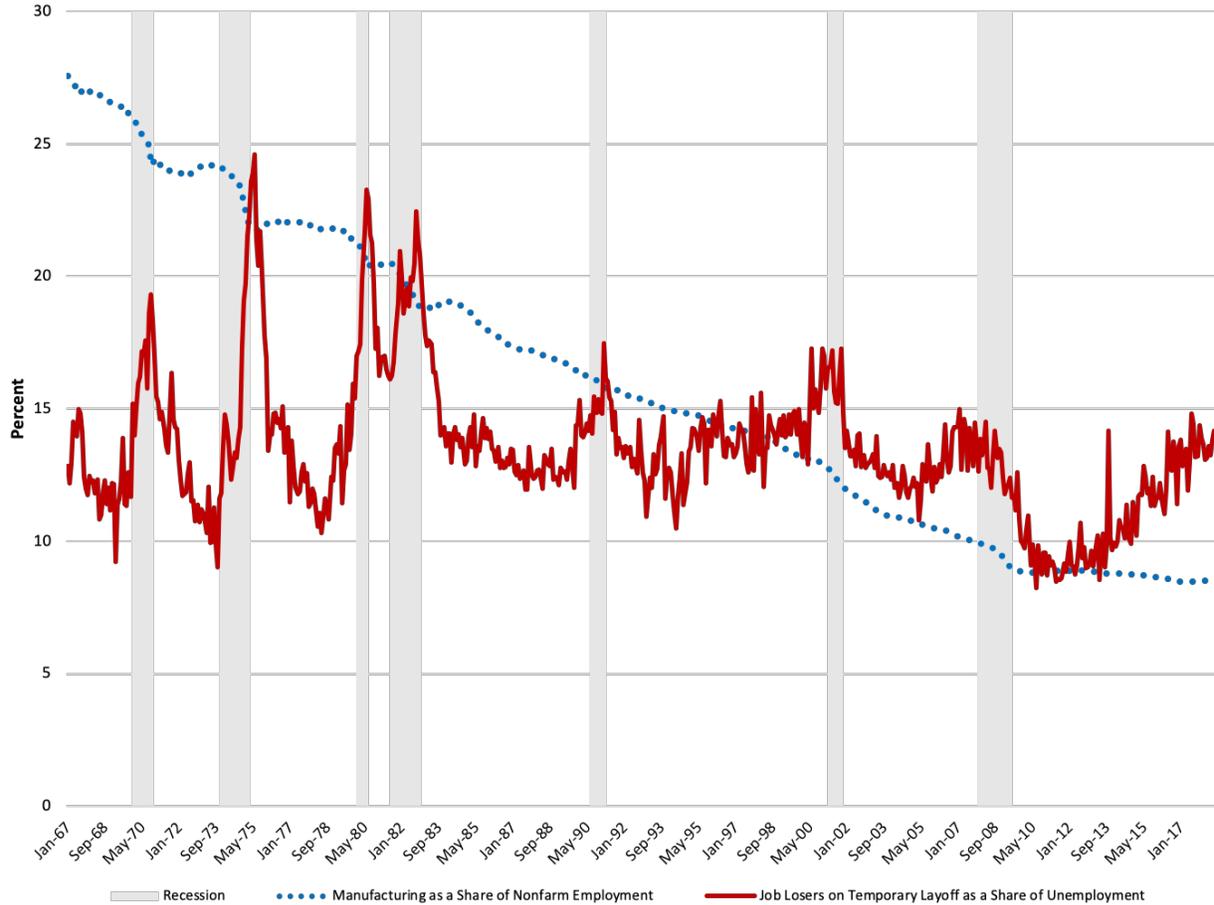
Note: This figure is created using seasonally adjusted data from the Bureau of Labor Statistics. Recession dates come from the National Bureau of Economic Research.

Non-wage benefits for employees may be playing an important role in the relative increase in the use of hours reduction as a method of weathering periods of slack demand. The implementation of the Affordable Care Act caused many to worry that the law's provisions would cause firms to reduce worker hours such that the firm could avoid paying health insurance benefit costs for their employees (Valletta and Bengali 2013). However, this provision of the law was not implemented until 2015, a point at which the ratio of those employed part time for economic reasons to the unemployment rate had already risen and subsequently plateaued. While the legislation may have influenced some firms to restructure their workforce, it does not seem to be the driving

force behind the phenomena seen in figure 1, as the timing is not consistent with the pattern changes. Preliminary research regarding the impacts on part time employment of the employer mandate provision of the Affordable Care Act suggests that there is some increased use of part time work, but it is concentrated in areas where part time work was already most common (Dillender et al. 2016). Along similar lines, the costs associated with full time employment and layoff as measured by unemployment insurance contribution rates could be playing a role in the relative increased use of hours reduction seen in figure 1.

In addition to changing non-wage compensation costs, there has been a fundamental shift in numerous labor related mechanisms due to the increased use of technology that has rapidly changed the landscape of employment and non-employment. The increased use of technology may be playing many roles in this phenomenon, as the rise of internet penetration amongst other technological advances correspond with the timing of the increased ratio of part time employment for economic reasons to the civilian unemployment rate as seen in figure 1. First, the increased use of hours scheduling software may allow employers to adapt quickly and easily as demand ebbs and flows for their business. This means that they can temporarily increase or decrease hours, thereby putting workers into and out of part time employment for economic reasons while working the same job for the same employer quite easily. Dynamic hours scheduling may be especially important in the service sector, where a number of factors, including weather, holidays, and local phenomena can quickly change demand.

Another way that technology may be playing a role in the increased use of hours reduction as a method of dealing with periods of slack demand is through the increased use of the internet in

job search, both by firms and by workers. Job search is now done primarily online where job seekers can find aggregated job listings, and easily submit application materials with the click of a button (Faberman and Kudlyak 2016). It is also easier for those who are currently employed to find employment with another employer, and Stevenson (2008) shows that employed job workers who use internet job search are more likely to be working for a different employer one month later than those who do not utilize internet job search methods.

The influence of the internet also affects the search and matching behavior of workers and firms in that it increases the number of applicants for a given position, such that firms may even be overwhelmed by applications (Autor 2001). If an individual makes far more applications because of the ease of application via the internet, then the individual may be less likely to accept an offer from a firm than they would be in the absence of the internet. Given the ease of application online, the marginal cost of additional applications, applications for jobs that the applicant may even be highly unlikely to accept, is very low. Given the low cost, the applicant may make applications that they would not make if they had to apply in person or respond through more traditional help wanted advertisement methods such as signs in windows or advertisements in newspapers. When it comes to the firm's side of the match, they may not be able to tell the applicants who are more or less likely to accept an offer given the large pool of applicants afforded by online job search. Stevenson (2008) uses monthly Current Population Survey data as well as the Current Population Survey Computer and Internet Use Supplement to demonstrate that job search activity grows as internet penetration increases.

However, the internet not only affects individuals differently, but firms as well. When a firm posts an ad on a job board, there are sorting algorithms that will determine which job seekers see the advertisement, and where within their search the advertisement will appear. These algorithms may sort postings in such a way that those at larger, more established firms are seen before the smaller firms in the same labor market (Google, 2018). If this is the case, the smaller firms would have a harder time finding a good match, as their postings are not as easily found by job searchers. Preliminary results from a simulation study of firm hiring shows that this is a possibility.

IV. Model Motivation

Why do some firms choose to use hours reduction, or involuntary part time employment, as a method for dealing with periods of slack demand? Why has the United States' economy seemed to shift away from the use of temporary layoff during periods of slack demand, as it has been a stalwart in times past? What is needed is a model that could explain why and when firms would choose one approach as opposed to another, and what matters in this decision.

When considering what may matter to a firm facing the decision of how to deal with a period of slack demand, one should consider the costs and benefits associated with a full-time employee, a part time employee, and the utilization of layoff. A potential consequence of the use of layoff is that a laid off employee will find other gainful employment while on layoff and therefore will not return to the job when recalled. This would cause the firm to have to hire and train a new employee to fill the position, incurring potentially significant costs, both financially and with respect to time.

Keeping an employee but temporarily reducing the hours that are worked does cut some of the costs associated with their employment. Some firms may cut the benefits of those who are working less than full time hours as allowed by law to reduce costs even more. While there are still costs associated with keeping the employee on reduced hours rather than layoff, it may reduce the likelihood that the worker will seek out other gainful employment and therefore leave their current employer during the period of hours reduction. This is beneficial to the firm because it retains the employer-employee match, and it does not necessitate the process of searching for, hiring, and training a new employee to fill the position.

The reasons laid out above, while plausible, seem like they would have always been true for firms. Why then, do we see changes in the use of layoff and the use of part time employment for economic reasons? This may stem from one of many changes that have taken place in the United States economy in recent decades. First is the shift from manufacturing to service-based employment within the U.S. economy. In the case of a manufacturing firm, it may have been more prudent to shut down an entire factory or factory line during periods of slack demand, as having workers run the machinery part time may not have been cost effective. Another possibility is the increase in benefit costs of all types that has taken place in recent decades. A third possible explanation comes from the increase in reliance on the internet for many parts of the employer-employee relationship as described above. All of these possibilities can be flushed out through a theoretical model of the decision facing a firm, as well as through probit analysis to determine the factors that affect the likelihood that an individual will experience part-time employment for economic reasons.

V. Presentation and Analysis of the Model

Necessitated by the interesting results described above, a model is needed to try and explain why a firm may choose to utilize hours reduction as opposed to layoff during periods of slack demand. A simple model for this purpose is constructed as follows.

A firm wants to choose and employment strategy that minimizes average cost over two states of the world, a period of low demand or a period of high demand, with demand denoted by D_L^t and D_H^t respectively. The constant probability of transitioning from the low state to the high state is denoted by λ_{LH} and from high to low is denoted by λ_{HL}. The fraction of the time a firm is in the high state is denoted by f_H and is equal to $\frac{\lambda_{HL}}{\lambda_{LH}+\lambda_{HL}}$. Similarly, the fraction of the time a firm is in the low state is denoted by f_L and is equal to $\frac{\lambda_{LH}}{\lambda_{HL}+\lambda_{LH}}$. It is important to note that the model assumes that in the high demand state, everyone is employed.[2]

Firms are either of two types; a firm that will use temporary layoff or a firm that will use hours reduction in the form of part time employment for economic reasons. The type of firm is determined by the relative magnitude of the partial derivatives of the cost function with respect to L, the number of persons on layoff, and with respect to P, the number of persons employed part time for economic reasons. The firm's objective is to minimize costs in a world with zero discounting. The firm therefore wants to choose an employment strategy in each regime to minimize overall average costs per period. It is assumed that part time workers are more productive and attrit at a lower rate than those who are part time. In terms of wages, those who

[2] A specification that does not make this assumption cam be made available upon request.

are employed full time earn higher wages than those who are employed part time. The cost function for a firm is;

$$E(C) = f_H\big[(w_f + ha_f)F_H\big] + f_L\big[(w_f + ha_f)F_L + (w_p + ha_p)p + L\Big(\frac{a_l h\lambda_{LH}}{\lambda_{LH} + a_l + \lambda_{HL}}\Big)\big]$$

Subject to:

$$F_H = D_t^H$$

$$F_L + 0.5pP = D_t^L$$

$$F_H = F_L + P + L$$

Where F_i is the number of full time employees in state i, a_f is the attrition rate of full time employees, a_p is the attrition rate of part time employees, and a_l is the attrition rate of employees on layoff, with $a_l > a_p > a_f$. Firms incur a hiring cost of h for each new worker hired. The firms face wages w_f and w_p for full time and part time workers respectively. It is assumed that part time employees are not as productive as those who are employed part time, and this is captured by p.

Utilizing the constraints of the model and substituting them into the original cost function yields the following cost function;

$$E(C) = f_H\big[(w_f + ha_f)(D_t^L - 0.5pP + P + L)\big] + f_L\big[(w_f + ha_f)(D_t^L - 0.5pP) + (w_p + ha_p)p$$

$$+ L\Big(\frac{a_l h\lambda_{LH}}{\lambda_{LH} + a_l + \lambda_{HL}}\Big)\big]$$

From this cost function, partial derivatives with respect to L and P can be taken.

$$\frac{\delta E(C)}{\delta L} = f_H\left[(w_f + ha_f)\right] + f_L\left[\frac{a_l h\lambda_{LH}}{\lambda_{LH} + a_l + \lambda_{HL}}\right]$$

$$\frac{\delta E(C)}{\delta P} = f_H\left[(w_f + ha_f) - 0.5p(w_f + ha_f)\right] + f_L\left[-0.5p(w_f - ha_f) + (w_p + ha_p)\right]$$

Since all terms in the two derivatives are constants there is bang-bang control – the firm will deal with slack demand by using either layoff or short hours but will not combine the two for people in the same job. Firms will choose to deal with slack demand through layoff if and only if

$\frac{2}{p}\frac{\delta E(C)}{\delta P} < \frac{\delta E(C)}{\delta L}$.

VI. Data

It is imperative to know the impacts of health care costs, unemployment insurance contribution rates, and internet penetration rates on the relative increase of part time employment for economic reasons. To test the impact these factors on involuntary part time employment, a probit model is used. Control variables include state, year, industry and occupation effects, as well as demographic and labor market specific factors.

For this model, the individual level labor force transition data used comes from the Bureau of Labor Statistics' Current Population Survey and covers the years of 1994 to 2018. This data set allows for knowledge of an individual's detailed employment status, industry, occupation, and demographic characteristics. From this data set it is possible to discern an individual's flows between employment categories by utilizing the gross flows methodology developed by Shimer (2012). For a discussion on the inherent issues with using matched CPS data, see Peracchi and Welch (1995) as well as Madrian and Lefgren (1999).

State level unemployment data comes from the Current Population Survey. To measure the trend unemployment level in a given state, a ten-year moving average is constructed. To estimate the contemporaneous labor market conditions within a state, the deviation from the ten-year moving average is calculated. These statistics are also calculated by education group within each state, where education is broken into four categories; those with less than a high school diploma, a high school diploma or equivalent, some college or an Associate's degree, and those with a Bachelor's degree or higher.

The rise of the internet has permeated the lives and households of labor market participants in the United States over the last 30 years. Starting with the creation of the World Wide Web in 1989, and its opening to the public in 1991, a whole new way of communicating, learning, and doing business began. The impacts of the internet on job search have been investigated along the lines of the impacts of the internet on search and matching behavior (Faberman and Kudlyak 2016). However, the impact of the internet on the composition of the labor market, specifically as it relates to involuntary part time employment, has been left untapped. Given the ease of online scheduling, and the changes in the way that workers search for and obtain jobs, it is important to know the impact that the internet has had on the compositional shift of the United States labor market as shown in figure 1.

Data on internet penetration comes from the Computer and Internet Use Supplement to the Current Population Survey. This supplement contained various questions about computer and internet use and access for various tasks inside and outside the home. The survey asked

respondents whether they had internet access in their household 8 times over the span of 17 years. However, the way that the question was asked changed over time. This is made evident through the data at the national and state level whereby internet penetration follows a consistent pattern for 6 out of the 8 surveys, while two surveys deviate from the pattern evidenced in all other years. Corresponding with the unusual behavior of the internet penetration estimates are changes in the way the questions was posed to respondents. For that reason, and because the question is only asked of respondents eight times over the span of 204 months a logistic adoption curve is fitted to the data to better estimate the level of internet penetration over time. This alleviates the problem of missing data points. The logistic adoption curves show a good deal of variation due to between state variation in adoption of the internet and the rate to which they asymptote, and this variation allows for the identification of the impact of internet penetration separate from time or within state trends. It is also interesting to note that the logistic adoption curves shown in figure 5 align roughly with the trend of the ratio of part time employment for economic reasons to the civilian unemployment rate.

The logistic adoption curve allows for an estimation of the level of internet penetration in a given state by month such that analysis can be done on a monthly level rather than relying on infrequent estimations of internet penetration afforded by the CPS data alone. To test the validity of the logistic adoption estimates, robustness testing of the models to follow is done using both the estimated values as well as the actual values of internet penetration, and the results remain valid. Figure 4 shows internet penetration as measured by the CPS Computer and Internet Use Supplement. Figure 5 shows the logistic adoption curves fitted to the data at the state level.

Figure 4: Internet Penetration by State, Survey Estimates
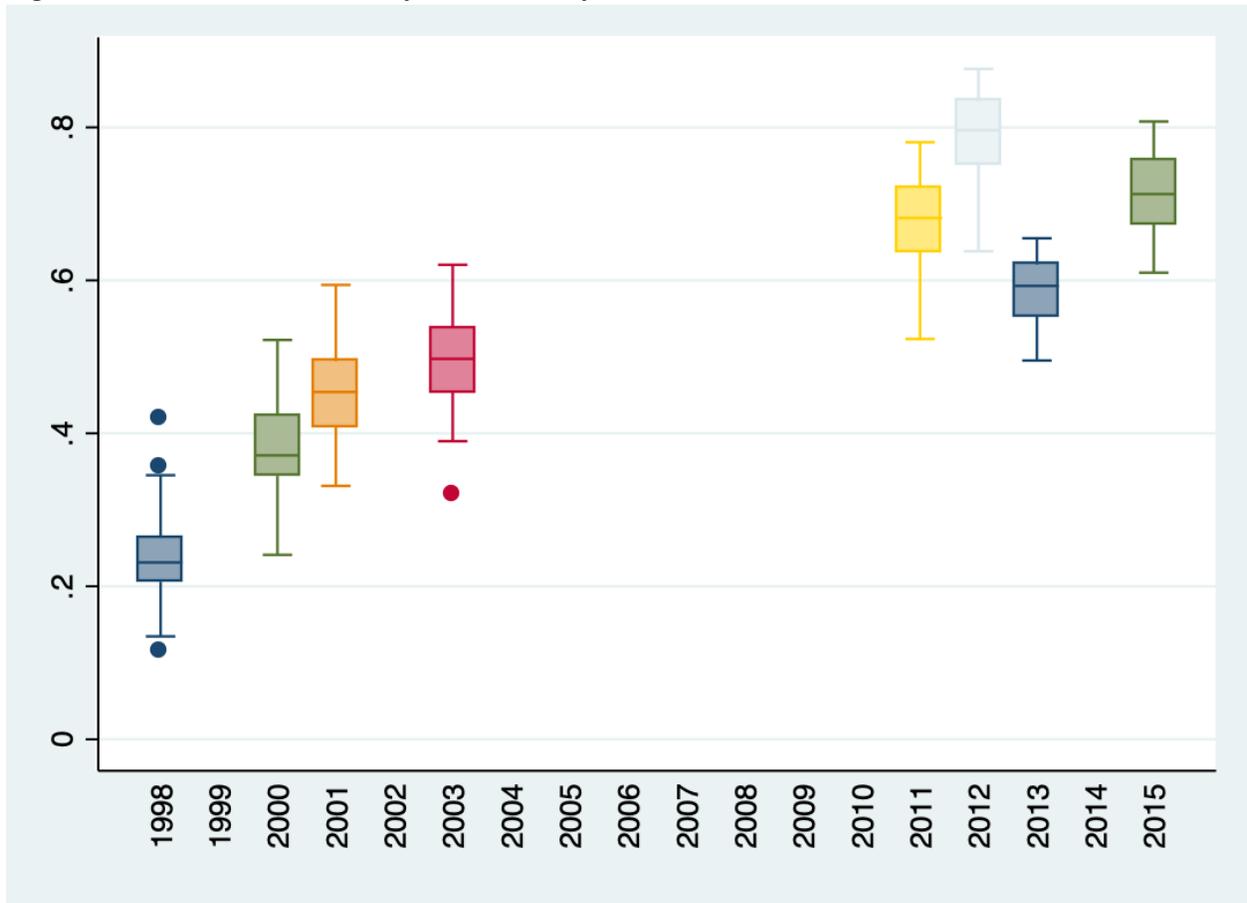
Source: Author's calculations using the Current Population Survey Computer and Internet Use Survey

Figure 5: Internet Penetration by State, Logistic Adoption Curves
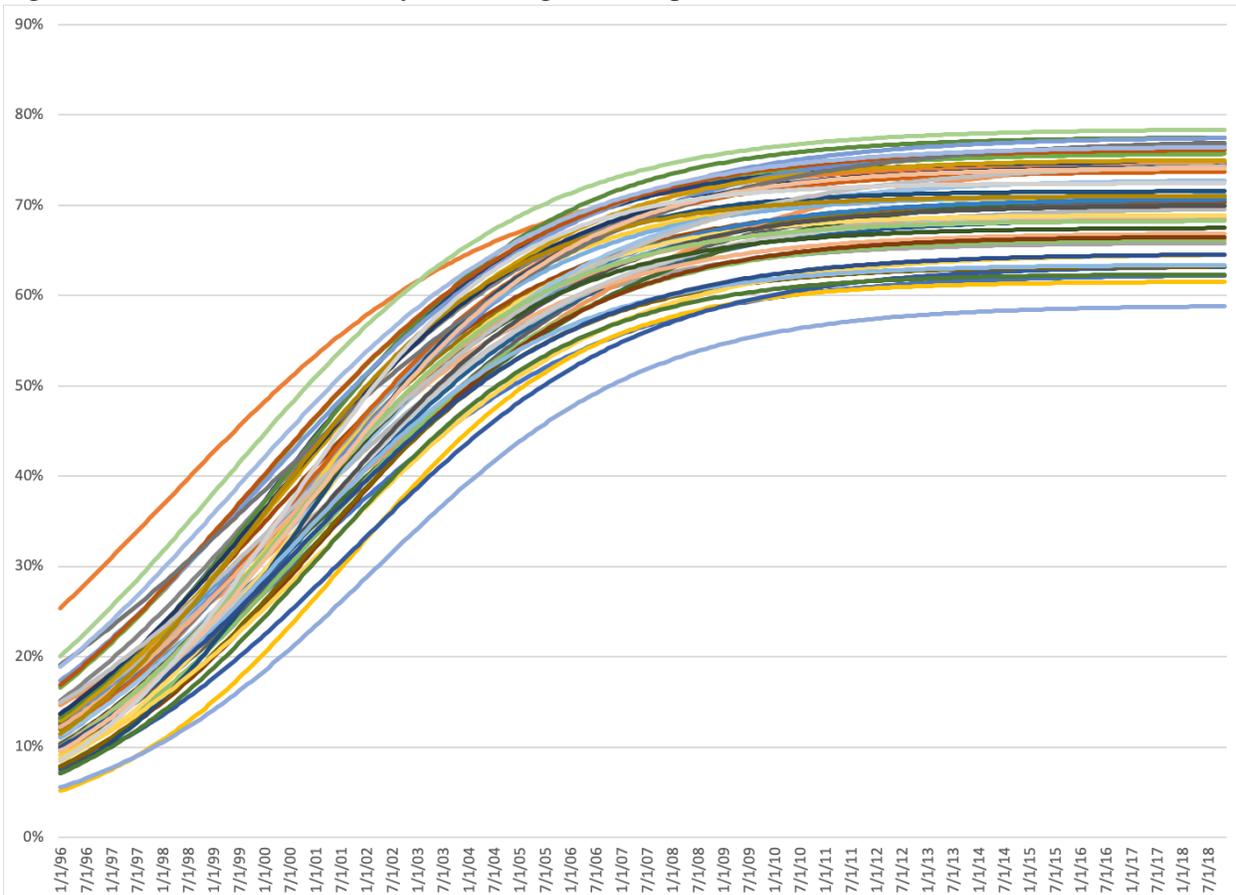
Source: Author's calculations using the Current Population Survey Computer and Internet Use Survey

To stress the need for logistic adoption curves and to show the quality of the fit, four sample logistic curves are shown in figure 6. Note that all states experience different initial penetration and different rates of internet penetration at the asymptote.

Figure 6: Sample of Logistic Adoption Curves; Selected States
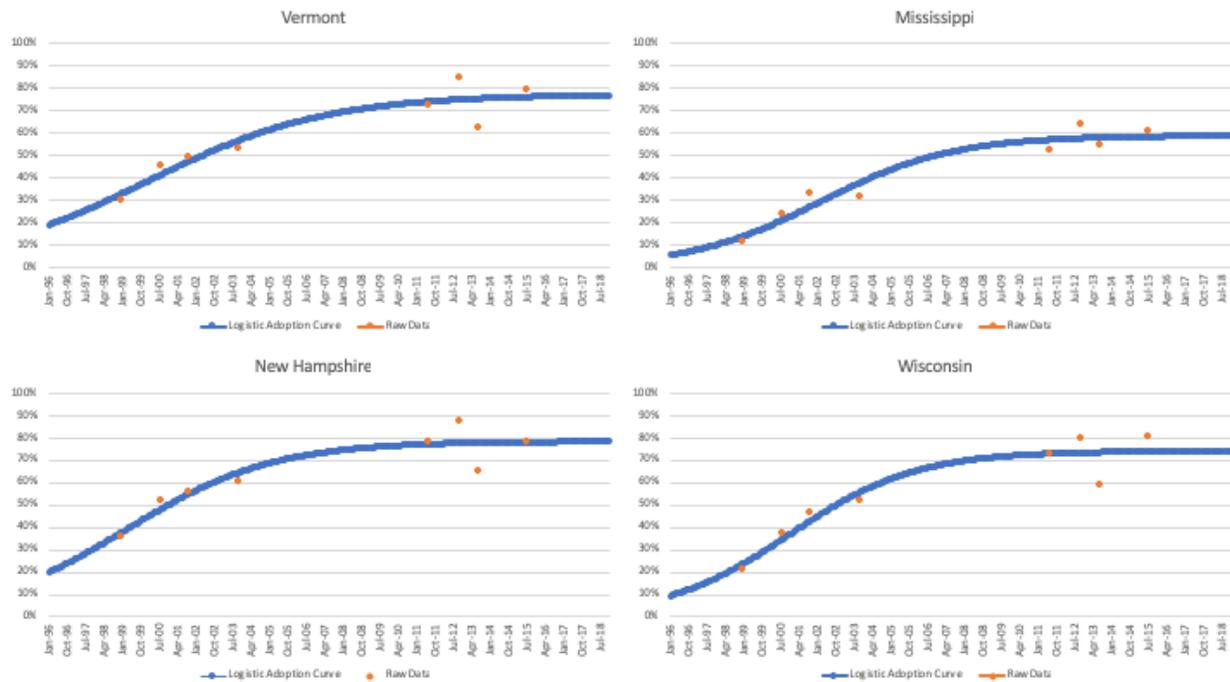
Source: Author's calculations using data from the Current Population Survey Computer and Internet Use Supplement.

Non-wage costs, most notably health care and unemployment insurance contributions, that are borne by employers may come into play when deciding to place an employee on short hours. Data on health insurance costs comes from the Kaiser Family Foundation. From data on health care expenditures, an index of annual healthcare costs by state is computed. This data treats 1991 as the base year of the series. Health care costs are a large portion of the non-wage benefits that an employer would provide to an employee. Due to the introduction of the ACA and the health care mandate as of 2015, it may be a consideration when a firm places a worker on short hours. Unemployment Insurance contributions by employers is another non-wage cost borne by firms. The yearly unemployment insurance contribution rate comes from the United States Department of Labor. This data is only available for years 2005-2017, so its use places a restriction on the data set.

VII. Results

To estimate the impact of internet penetration and benefit costs on the likelihood that an individual has been employed part time for economic reasons for any part of the month, probit estimations are calculated, with the dependent variable taking the value of one if the person has experienced part time employment for economic reasons. The data is limited to those who have actively participated in the labor force in the previous month, or who are actively participating in the labor force in the current month.

There is concern that there could be something affecting both those who are highly educated and those who have relatively low education at the same time that the internet is becoming more prevalent. For that reason, education level is a continuous variable taking on a value of 1 if the individual has less than a high school diploma, 2 for a high school diploma or equivalent, 3 for some college or an Associate's degree, and 4 for those with a Bachelor's degree or higher. Then, rather than measuring trend and deviation from trend unemployment at the state level, it is measured at the state level for each education group. There may be local labor market phenomena that affect different classes of workers in different ways, so these specifications accounts for that. It is important to note that it has been shown that it is primarily low-education workers who experience part time employment for economic reasons (Canon et al. 2014).

Table 4: Probit Results: Marginal Effects

	Part Time for Economic Reasons (Model 1)		Part Time for Economic Reasons (Model 2)		Part Time for Economic Reasons (Model 3)		Part Time for Economic Reasons (Model 4)		Part Time for Economic Reasons (Model 5)	
Internet Penetration	0.0002	***					0.0001	***	0.0003	***
	(0.0000)						(0.0000)		(0.0001)	
Health Care Cost Index			-0.0001	***			-0.0001	***	-0.0001	***
			(0.0000)				(0.0000)		(0.0000)	
Unemployment Insurance Contribution					0.0066	***			0.0077	***
					(0.0005)				(0.0005)	
Trend Unemployment	0.0014	***	0.0013	***	0.0015	***	0.0013	***	0.0014	***
	(0.0001)		(0.0001)		(0.0001)		(0.0001)		(0.0001)	
Deviation from Trend Unemployment	0.0019	***	0.0019	***	0.0014	***	0.0018	***	0.0014	***
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)	
Deviation * Some High School	-0.0013	***	-0.0013	***	-0.0010	***	-0.0013	***	-0.0009	***
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)	
Deviation * High School	-0.0008	***	-0.0008	***	-0.0007	***	-0.0007	***	-0.0007	***
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)	
Deviation * Some College or Associates	-0.0003	***	-0.0003	**	-0.0001		-0.0003	**	-0.0001	
	(0.0000)		(0.0001)		(0.0002)		(0.0001)		(0.0002)	
Education Level	-0.0044	***	-0.0047	***	-0.0055	***	-0.0047	***	-0.0058	***
	(0.0001)		(0.0001)		(0.0002)		(0.0002)		(0.0003)	
Age	-0.0007	***	-0.0007	***	-0.0008	***	-0.0007	***	-0.0008	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Race: Black	0.0098	***	0.0097	***	0.0104	***	0.0097	***	0.0103	***
	(0.0002)		(0.0002)		(0.0003)		(0.0002)		(0.0003)	
Race: Hispanic	0.0070	***	0.0069	***	0.0079	***	0.0068	***	0.0078	***
	(0.0007)		(0.0007)		(0.0011)		(0.0007)		(0.0011)	
Race: Other non-white	0.0019	***	0.0019	***	0.0006		0.0019	***	0.0004	
	(0.0002)		(0.0002)		(0.0003)		(0.0003)		(0.0004)	
Sex: Male	-0.0160	***	-0.0159	***	-0.0179	***	-0.0159	***	-0.0178	***
	(0.0001)		(0.0001)		(0.0002)		(0.0001)		(0.0002)	
State Fixed Effects	Y		Y		Y		Y		Y	
Time Fixed Effects	Y		Y		Y		Y		Y	
Industry Fixed Effects	Y		Y		Y		Y		Y	
Occupation Fixed Effects	Y		Y		Y		Y		Y	
N	6935688		6935688		4065734		6935688		4065734	

Source: Author's calculations using the Current Population Survey

Note: Delta-method standard errors in parentheses. *** indicates significance at 0.01 level, ** 0.05 level, * 0.10 level.

The first three specifications investigate the three major potential drivers of part time employment for economic reasons, internet penetration, health care costs, and unemployment insurance contribution rates, while controlling for state, year, industry and occupation, as well as labor market and demographic characteristics.

Internet penetration when examined alone has a positive and statistically significant impact on the likelihood that an individual experiences part time employment for economic reasons. This follows from the hypothesis that the internet has changed the way that the labor market functions along many lines.

First, the internet affects the way that employers and potential employees match and perform job search. This can impact hiring costs on behalf of the firm, and the likelihood that an individual finds employment. The internet may also affect involuntary part time employment through dynamic hours scheduling. As the United States shifts more towards service-based industries, dynamic hours scheduling might become more common for employers that face rapidly changing demand due to market and non-market factors.

The marginal effect of internet penetration has a positive and statistically significant impact on the likelihood that a labor market participant experiences part time employment for economic reasons. When examining internet penetration alone (Model 1), a ten percent increase in internet penetration in a given state increases the likelihood that a labor market participant experiences part time employment for economic reasons by 0.2 percentage points. Once variables for health care costs and unemployment insurance contribution rates are included (Model 5), a ten percent increase in internet penetration within a state increases the likelihood that a labor market participant experiences part time employment for economic reasons by 0.3 percentage points.

Health care costs may be influencing the relative increase in part time employment for economic reasons as firms may try to cut costs associated with providing benefits to workers. The

Affordable Care Act's employer mandate required that firms provide health care benefits to full time employees. There was concern that with the implementation of the mandate firms would reduce a worker's hours in order to legally shirk the costs of providing health insurance. When examining the marginal effect that health care costs have on the likelihood that a labor market participant experiences part time employment for economic reasons, there is a negative and statistically significant effect. This is a somewhat surprising result, as one would expect health care costs to increase the likelihood of an employer cutting a worker's hours to save on both wage and non-wage costs. However, as shown in tables 2 and 3, workers who are employed part time for economic reasons are highly likely to be oscillating between full time and part time status with the same firm and job description. If this is the case, the firm would likely not be turning health care benefits on and off for the worker each time they change between hours categories, but rather continuing the benefits throughout the spell of short hours. An increase in health care costs decreases the likelihood that a labor market participant experiences part time employment for economic reasons, regardless of model specification, suggesting that employers may use other methods of cost reduction (i.e. temporary layoff) in response to increasing health care costs.

Unemployment insurance contribution rates serve as a proxy for non-wage, non-health related costs faced by an employer. Firms will want to try and avoid increasing their contribution rates due to successful unemployment insurance claims against them. In addition, firms may want to retain existing workers as the contribution rates for newly hired workers are fixed for three years before they may go down. If a firm can keep an existing worker on by reducing their hours temporarily in an effort to keep the employer-employee match during slack business conditions,

it greatly benefits the firm with respect to unemployment insurance contribution rates. The marginal effects of unemployment insurance contribution rates on the likelihood of a labor market participant experiencing part time employment for economic reasons are positive and statistically significant. A one percent increase in unemployment insurance contribution rates corresponds to a 0.7 to 0.8 percentage point increase in the likelihood that a labor market participant experiences part time employment for economic reasons, depending on model specification. Although this seems incredibly large, it is important to note that UI contribution rates max out at 2 percent of average earnings.

It is important to note that data on unemployment insurance contribution rates are only available for a selected subset of years within the data set, so using them in a regression model limits the sample size. For that reason, a model with both internet penetration and health care costs is run without unemployment insurance contribution rates to ensure that the marginal effects of those two variables are not affected by the restricted sample size (Model 4).

The models suggest that when a state's trend unemployment is higher, an individual within that state would be more likely to experience part time employment for economic reasons. Given a weaker local labor market, workers may be more willing to accept hours reductions since they may not have as many outside options as a worker who resides in a state with a stronger local labor market. Outside options for the worker may be few, so staying with the firm and accepting the temporary hours reduction may be the optimal choice. Demographic characteristics of race, age, and gender all have statistically significant impacts consistent with the findings of Canon et al. (2014).

There is a potential reason for concern regarding the use of logistic adoption curves to estimate internet penetration at the state level by month, given that there are only eight data points from which these curves were estimated. However, all results are robust to using the actual monthly data points in place of those computed by the logistic adoption curves for each state, thereby not reducing the sample size. If only the eight observed months are used, the model loses all significance, though the sign and magnitude of the coefficients of interest remain the same.

VIII. Conclusion

It is clear that the United States economy is behaving in ways that contradict conventional models in terms of inflation and wage growth, given an unemployment rate below four percent. One potential reason for the stymied inflation is that the labor market is experiencing some form of slack that is not measured in the most common labor market statistics.

Beginning prior to the Great Recession, the ratio of those employed part time for economic reasons to the civilian unemployment rate has been on the rise, plateauing in recent years at a level far above those experienced in the 1990s. Given the sectoral shift of the United States economy from manufacturing to service-based employment, coupled with the advent of the internet as a tool for job search and matching, it is quite possible that the change in the relative composition of the labor market with respect to those employed part time for economic reasons is a driving factor in inflation suppression and sluggish wage growth.

Unemployment insurance contribution rates and health care costs have statistically significant, and in the case of health care costs, surprising impacts on the likelihood that a labor market participant experiences part time employment for economic reasons. While these results are important, they are not wholly unexpected. What is far more interesting is the impact that internet penetration has on the likelihood that a labor market participant experiences part time employment for economic reasons.

Part time employment for economic reasons is strongly influenced by internet penetration within the local labor market, be it within the search and matching process undertaken by firms and employees, or through the use of dynamic hours scheduling on the part of employers. Both of these stories, coupled with society's complete dependence on internet-connected devices suggest that the structural change in the relative use of part time employment for economic reasons, and its ramifications on the United States economy are not going away any time soon.

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Appendix:

A1. Shift Share Analysis Detailed Breakdown: Demographics

Demographics			
	Age	Race	Gender
FORWARD SHARE			
Share within:	1.11	0.90	0.98
Share of shift:	-0.12	0.09	0.01
Interaction share	0.01	0.01	0.01
BACKWARD SHARE			
Share within:	1.12	0.91	0.99
Share of shift:	-0.11	0.10	0.02
Interaction share	-0.01	-0.01	-0.01

Source: Author's calculations using the Current Population Survey

A2. Shift Share Analysis Detailed Breakdown: Industry

Industry			
	All Industries	Accommodation	Retail
FORWARD SHARE			
Share within:	0.88	0.96	0.99
Share of shift:	0.04	0.02	-0.02
Interaction share	0.08	0.02	0.04
BACKWARD SHARE			
Share within:	0.96	0.98	1.02
Share of shift:	0.12	0.04	0.01
Interaction share	-0.08	-0.02	-0.04

Source: Author's calculations using the Current Population Survey

A3. Shift Share Analysis Detailed Breakdown: Occupations

	All Occupations	Building and Grounds Cleaning and Maintenance	Education, Training, and Library	Food Preparation and Serving Related	Office and Administrative Support	Personal Care and Service	Sales and Related
FORWARD SHARE							
Share within:	0.88	0.95	0.92	0.99	0.76	0.97	0.79
Share of shift:	0.03	0.01	0.05	0.01	0.11	-0.08	0.11
Interaction share	0.08	0.04	0.03	-0.01	0.13	0.11	0.09
BACKWARD SHARE							
Share within:	0.97	0.99	0.95	0.99	0.89	1.08	0.89
Share of shift:	0.12	0.05	0.08	0.01	0.24	0.03	0.21
Interaction share	-0.08	-0.04	-0.03	0.01	-0.13	-0.11	-0.09

Source: Author's calculations using the Current Population Survey

A4. Transition Matrix for Non-Part Time for Economic Reasons, Part Time for Economic Reasons, and Non-Employment

	PTER	Non-PTER	NE
PTER	36.86%	55.25%	7.89%
Non-PTER	2.05%	94.69%	3.26%
NE	0.62%	5.20%	94.18%

Source: Author's Calculations using the Current Population Survey

*PTER = Employed Part Time for Economic Reasons, Non-PTER = Employed, not Part Time for Economic Reasons, NE = Not Employed