# KURZARBEIT BIS LANG-ARBEITER: DO EUROPEAN SHORT-TIME WORK PROGRAMS PREVENT LONG-RUN UNEMPLOYMENT INCREASES?

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**Abstract**

This research paper analyzes the impact of short-time work programs on changes in the unemployment rate of workers ages 25-54 in 17 European countries over a 10-year period. Short-time work programs share common characteristics, but differ by country in their eligibility and conditionality requirements and overall generosity. European trends in unemployment and firm-level inefficiencies evidence a need for programs that reduce inefficient separation during economic downturns. Through a differences-in-differences regression analysis that exploits variations in program use and take-up rate across European countries, this paper determines that an increased short-time work program take-up rate during periods of decreased output is associated with a statistically significant decrease in unemployment fluctuations. The research explores regional trends in unemployment and political and demographic trends in short-time work take-up, and concludes by proposing potential paths for future study. (JEL Classification Codes: J08, J64, J65, J68)

## 1 Introduction

After the economies of Europe finally began to stand on shaky legs after back-to-back economic crises, they were shoved under the market-crushing wave of a global pandemic. The new regulations of this uniquely challenging era require social distancing, work from home, and the lowest possible exposure to others– hardly a recipe for an economic boom. Market conditions have worsened as restaurants and small businesses crumble under the weight of the emptied marketplace. As short-term furloughs start looking increasingly like permanent layoffs, aggregate demand has undergone an agonizing recoil. A multi-billion dollar question seems to arise from the chaos: by what means can we smooth this demand shock out and prevent decades of painful recovery?

As economists and politicians alike scramble to find long-term solutions to massive exogenous shocks in the job market, many among them have locked in on a tried-and-true method of job preservation in Europe. Short-time work schemes, such as the Kurzarbeit system in Germany, have been utilized by dozens of European nations to tamper economic blows to the labor market. The short-time work system involves an agreement between the government and a qualifying firm during a time of temporarily decreased demand: the firm decreases the hours of workers rather than laying them off, and the government provides the funds for up to 100 percent of the worker's original paycheck (Hijzen and Venn 2011). The ultimate goal of the German Kurzarbeit system, as well as programs like it, is to keep aggregate demand afloat and prevent inefficient separations in the labor market. Of course, the appeal of such a program under pandemic conditions has not gone unnoticed. Analysts have lauded the program's ability to keep total employment up while keeping the number of on-site workers down in the industries that require physical presence. A number of researchers have analyzed firm-level data on the German Kurzarbeit system, cross-country studies on the swiftness of disaster adjustment, and the particulars of what makes a "good" short-time work system. However, there is a lack of literature addressing the central intention of the system – do short-time work programs actually reduce unemployment in the long run? While the COVID-19 crisis is still ongoing, the data to observe current trends is lacking. Luckily, there is comprehensive documentation of the rapid and dramatic increase in European short-time work use during and after the 2008 financial crisis. Utilizing this, we may explore the long-term effects of program use on fluctuations in unemployment and predict its potential impacts in contemporary applications.

This research paper seeks to determine whether employer take-up of short-time work programs has a statistically significant impact on unemployment in Europe during and directly following a period of economic crisis. The second section addresses the modern history of short time work. Section three utilizes simplified models of firm behavior to explain the labor market deficiencies that short-time work intends to remedy. Section four observes the previous literature on the subject at the firm, country, and international level. Sections five and six examine the construction and results of a panel data analysis utilizing a difference-in-differences model to measure the impact of short-time work take-up rate on percentage changes in the rate of unemployment; this section also features a subsection analyzing the demographic and policy-based trends in take up rate. Finally, section seven concludes with a discussion of the results and the potential extension of this analysis in future studies.

## 2 Key Features of Short-Time Work Programs

National short-time work programs are neither new nor exclusive to Europe. Germany has paid for short-time benefits during economic downturns since 1969, marking over half a century of program use to date (Abraham and Housemann 1992, 3). Since then, the implementation of short-time work has spread far beyond the German borders. The program was utilized heavily during the 2008 recession: at the onset, 18 countries of the 33 OECD countries operated short-time work programs, and that number rose to 25 by the end of 2009 (Cahuc and Carcillo 2011, 134). Each nation set rules, regulations, duration of short-time work, and compensation according to the needs of the market and the capacity of their respective governments. Nevertheless, European programs in particular share a number of features in common: they are intended to operate only in the short term, they require firms to meet particular eligibility requirements, and they provide government coverage of a portion of the employee's original paycheck. The major variances in short-time work programs stem from eligibility and conditionality requirements and program generosity.

According to data summarized by Hijzen and Venn in their seminal research on short-time work programs, a number of countries with short-time work programs have minimums and maximums on the reduction in hours worked (2011). Austria, Belgium, and the Netherlands have maximum reduction rates below 100 percent. The researchers explain that countries may set these limits in order to encourage greater spreading of the burden in hours reductions. In contrast, higher minimum reductions may be set in place by countries who want to prevent overuse of the program; a majority of nations implement a minimum number of hours for short-time workers

**Table 1: Minimum and Maximum Reductions in Weekly Working Hours for European Short-Time Workers**

| Country | Minimum | Maximum |
|---|---|---|
| Austria | 0.1 | 0.9 |
| Belgium | 0 | 1 |
| Czech Republic | 0 | 1 |
| France | 0 | 1 |
| Germany | 0.1 | 1 |
| Hungary | 0.2 | 1 |
| Ireland | 0.4 | 1 |
| Italy | 0 | 1 |
| Netherlands | 0.2 | 0.5 |
| Norway | 0.4 | 1 |
| Poland | 0 | 1 |
| Portugal | 0 | 1 |
| Spain | 0.33 | 1 |

Data obtained from Hijzen and Venn (2011).

Hijzen and Venn also collected data on variations in eligibility and conditionality requirements across countries with short-time work programs. Eligibility and conditionality requirements are the conditions in place that the firm must meet in order to qualify for enrollment in a short-time work program. Common eligibility requirements in OECD countries include a justification of need, a social partner agreement, and that participating workers be eligible for unemployment benefits. Common

conditionality requirements include compulsory training, job searches for short-time workers, a firm recovery plan, and limits on firing short-time workers. More stringent eligibility and conditionality requirements are intended to screen candidates more heavily before entry into a short-time work program. Higher requirements necessarily result in less enrollment in short-time work programs, and requirements such as necessitating job searching may incentivize inefficient separation in the labor market (Hijzen and Venn, 2011). However, these requirements also mitigate the possibility of inefficient retention of workers. Firms are incentivized to adjust to decreased demand more efficiently and only use short-time work programs as a last resort. These requirements also have the potential to decrease moral hazard. Firms must commit to structural changes, such as planning for future recovery and training their workers; these costly commitments may serve to eliminate firms who seek to take short-time work funds in order to avoid eliminating inefficient practices or redundant workers during a recession.

In contrast to the limiting factors of eligibility and conditionality requirements, program generosity measures are designed to increase participation. More generous programs tend to be more expensive, as governments utilize primarily monetary incentives to encourage firm use. In Belgium, Denmark, Finland, Ireland, and Spain, firms bear none of the cost of hours not worked under short-time work (Hijzen and Venn, 2011). The cost of the program is also incorporated into the total compensation for short-time workers; countries with well-funded programs require a much smaller decrease in each participating worker's paycheck. Hijzen and Venn additionally note that more generous countries also tend to have longer maximum durations for short-time work. Program duration by country ranges massively, from 3 months in Slovakia to 36 months in Finland, and increases to duration can significantly impact the timeline for firm recovery. When it comes to being generous, however, countries tend to be limited by their pocketbooks. Nations with higher GDPs and more resilient economies are more capable of providing extra perks for firms to prevent unemployment rises. Countries must therefore determine how to best balance program expenditure with expected economic return, as extra spending may cover its own costs in the future through greater long-run output and stability.

# 3 Understanding and Modeling the Goals of Short-Time Work

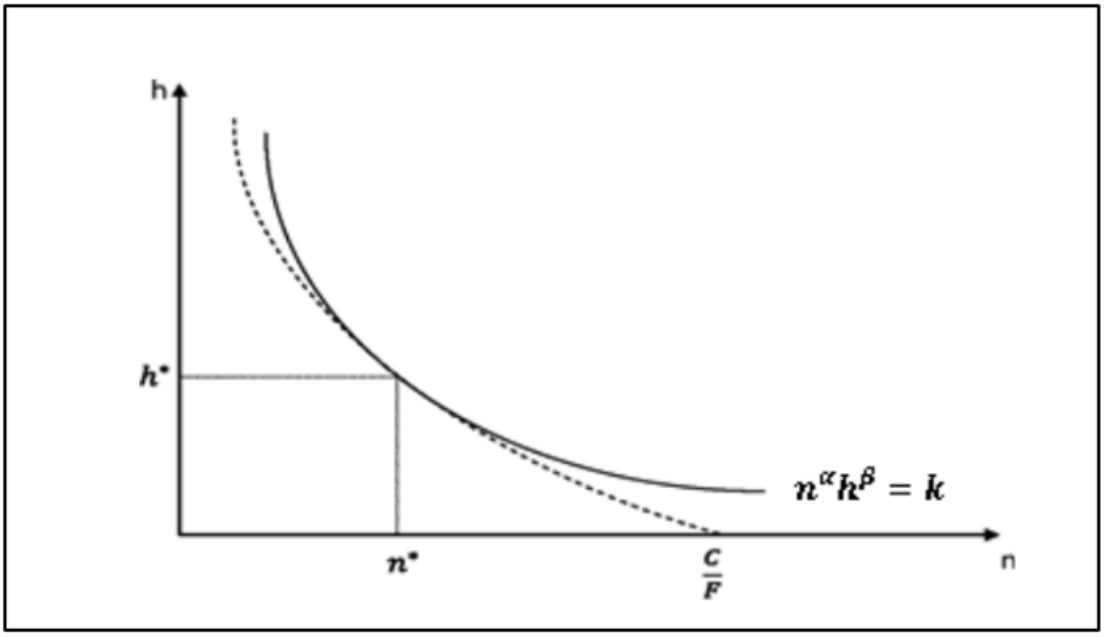
National determinations on program expenditures, program rules and regulations, and the various minutiae of design are hefty undertakings. The need for such programs must therefore be present and unaddressed to make such ventures worthwhile. This section undertakes the task of detailing the labor market gaps that short-time work programs are designed to fill, and how they are uniquely suited to doing so.

In Europe, the need for programs that retain workers is readily apparent. Ljungqvust and Sargent (1998) found that labor force participants experience massive losses of human capital over a sustained period of unemployment. This decrease in value decreases their potential earnings in turn, and in countries with robust welfare programs, the monetary impetus to return to the workforce is significantly diminished. Workers who had high previous earnings are especially resistant to returning to the workforce following the diminishment of their skills, and resultantly, their potential future earnings. In the case of a shock, the researchers find that economies with strong welfare programs recover less swiftly than those with lower unemployment compensation, resulting in longer term bouts of unemployment. This is because previously high earners may face such a stark decrease in their potential earnings that they stand to earn more by remaining on unemployment benefits. While the issue is particularly stark in countries with robust welfare programs, the researchers note that the same long-term discouragement trends can be found in nations with weaker social safety nets as the time out of work decreases human capital. The researchers note that former manufacturing workers are disproportionately represented among the long-term unemployed, since their skills diminish rapidly and decrease their potential future earnings. Short-time work programs may offer the solution to this by preventing the loss of human capital. In fact, short-time programs are most heavily utilized by manufacturing firms: Hijzen and Venn (2011) note that during the 2008 financial crisis, the average monthly short-time work take-up rate in the manufacturing sector reached 9 percent in selected years (p. 19). Short-time work is a particularly valuable mechanism, therefore, for firms that specialize in specialized skilled labor with high initial training costs. It is worth noting that while short-time work is disproportionately used by manufacturing firms due to the highly specialized skill sets within the industry, program use is not exclusive to this sector. The short-time work take-up rate in the construction sector and the agriculture

sector rose by approximately three and two percent, respectively, during the financial crisis (Hijzen and Venn 2011, 17). Sectors related to services, on the other hand, rose by less than one percent over the duration of the crisis (Hijzen and Venn 2011, 19). This may be because the incentives to engage in short-time work programs are greater in the goods-producing sector, where particular skill sets require tailored training. The following models are based on firm behavior and contract design in the goods-producing sector to model the intended impact of short-time work on the firms most likely to benefit from the program.

The method by which short-time work programs can aid in retaining jobs can be best understood through models of individual firms during a crisis period. Boeri and Bruecker (2011) utilize an isolabor curve to explain the substitution effect, or ability to switch to a cheaper alternative during a time of increased expense, introduced by a national short-time work program (Figure 1). The firm's output can be produced through some number of workers, n, and some number of hours worked, h, in the production function $y = n^{\alpha}\ h^{\beta}$, where both hours and workers exhibit diminishing marginal returns. Labor costs are shown in the isocost function $C=n(F+wh)$, and the firm will obtain its target output level at the intersection of the two curves. In countries without short-time work programs, the researchers found that the optimal number of hours for a firm is independent of the target output; therefore, "changes in the scale of production affect the number of workers, but not the hours of work per employees (707)." In firms that do not utilize short-time work, employment adjustments are therefore concentrated at the extensive margin. Though firms may be indifferent to the form of adjustment, employees are not, and this discrepancy leads to job loss of the efficient outcome.

**Figure 1: Isolabor Curve for Firm Without Short-Time Work**



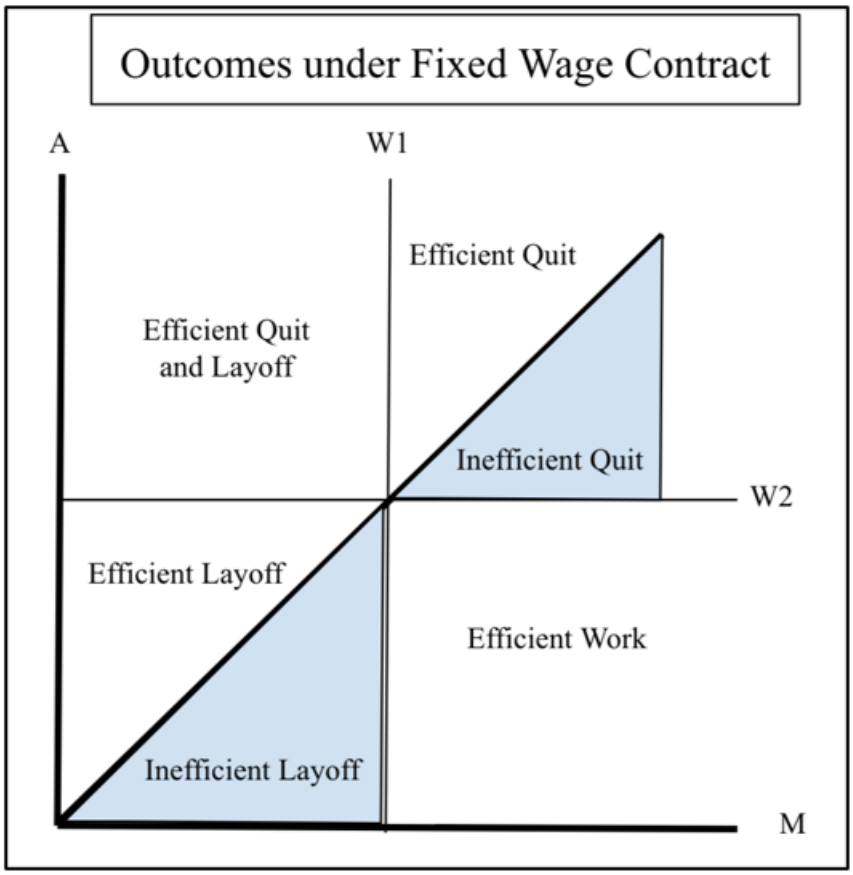

Obtained from Boeri and Bruecker (2011, 706).

In order to remedy this, the researchers derive that employers can be incentivized to reduce hours instead of workers by making labor costs more responsive to decreased hours. Short-time work programs accomplish this by covering more in wages for hours lost than the firm would pay along its isolabor function. Simply put, firms operating under short-time work programs receive a reduction in hourly costs per worker as an incentive to reduce the number of hours worked instead of the number of workers. Short-time work therefore biases the labor adjustment towards the intensive margin. This intensive adjustment is referred to as work-sharing, since the burden of reduced hours and wages is distributed across many employees in order to avoid reducing the number of workers.

Hall and Lazear (1984) further explore the inefficiency of layoffs in their simplified model of fixed-wage work contracts. In this model, long-term contracts are set on the basis of M, the profitability and overall success of the firm, and A, the conditions of the labor market outside of the firm. The

model operates on the maximization of the equation E(XM + (1 - X)A), where X is a binary variable that takes the value of 1 when M is large and the value of 0 when A is large. Therefore, firm contracts attempt to ensure employment when the firm is doing well and allow for separation between the firm and the worker when the worker may have higher value opportunities in the greater marketplace. Work should therefore continue only when M¿A, or when the employee has a comparative advantage within the firm. The firm lays off the worker if the wage rate exceeds M, and the worker quits if A, their outside market earnings potential, exceeds their wage. However, this worker contract model holds the potential for both efficient and inefficient quits and layoffs. The lower left triangle represents an inefficient layoff where the worker is dismissed because the firm is doing poorly (M is low), but the market is faring even worse (A is lower than M). Such are the conditions of an exogenous demand shock such as a recession.

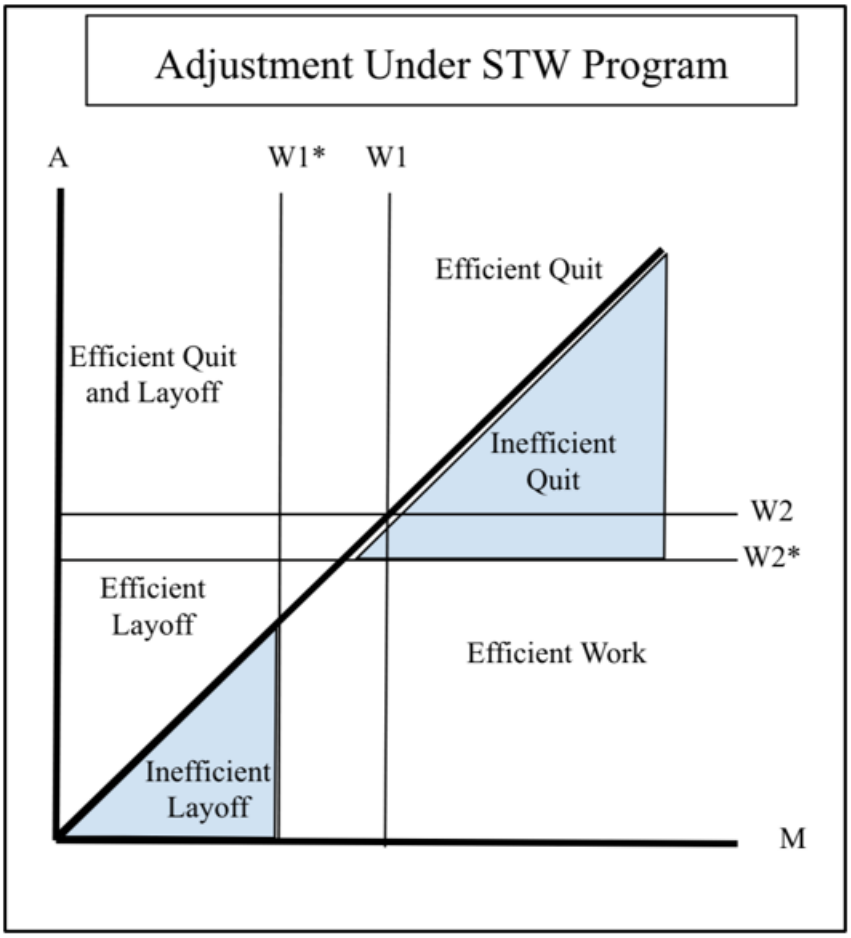
**Figure 2: Firm Outcomes under Fixed Wage Contract, No STW Program**




Model obtained from Hall and Lazear (1984, 12a).

Short-time work programs attempt to adjust the cost of keeping the worker in order to shift the fixed-wage work contract into the quadrant of efficient work. They do so by shifting the wage line leftward from the point of view of the firm. Because the firm must now cover less of the fixed costs of continued employment, they are incentivized to retain the worker until conditions improve. This has the potential to mitigate the losses of inefficient separation. From the point of view of the employee, their wage only decreases marginally. This has the potential to result in an inefficient quit, as the employee's wage may decrease more than their post-recession value to the firm; this depends on program generosity. The impact on reducing inefficient layoffs is designed to outweigh this trend. This design, however, depends on the restoration of productivity following the recession. If the firm is unable to restore itself after the recession, or if workers are preserved in this shift who may have been otherwise efficiently laid off, then short-time work programs may actually cause as many inefficiencies in the post-recessionary period as they solve in the short run.

**Figure 3: Firm Outcomes under Fixed Wage Contract, STW Program**




Model derived from Hall and Lazear (1984, 12a).

# 4 Literature Review

Existing studies of short-time work programs can be divided into two primary categories: those that examine the program of a single country, and those that compare multiple countries' programs. Single-country studies are often conducted at the microeconomic level, as researchers can collect more detailed information from local firms. This additional data can often provide more accurate quantitative conclusions regarding the number of jobs saved, the types of firms that participate in the program, and the direct national expenditures on the program. However, their results are often limited to the country under examination. Further, firm-level studies are often skewed by selection bias, since suffering firms are more likely to apply for short-time work programs; this may make the programs appear less effective than under a more controlled randomized experiment. Comparative analyses are usually much broader economic surveys. They are limited to the data available for all countries in the survey, so the researchers cannot make more particular assumptions about program design, individual firm participation, and national cost. What they lose in detailed analysis, however, they gain in overall applicability. The outcomes and potential caveats of six studies, three at the country level and three comparative analyses are explored below.

## 4.1 Country Level Studies

Balleer, et al. (2016) utilize German microeconomic data and a macroeconomic labor market model to study the stabilization effects of short-time work. The researchers determine through counterfactual

analysis of the German labor market that short-time work schemes directly reduce firing, and by increasing the value of a job, short-time work may indirectly increase hiring. The results of the study determine that the presence of a short-time work program in the national economy reduces fluctuations in national unemployment by approximately 21 percent. The study separates the rule-based component of short-time work, which describes the automatic stabilization effect that more firms are eligible for the program during a recession, from the discretionary components, or specific features of eligibility and generosity that change frequently within the program. Particularly, programs tend to become more generous and lower their barriers to entry during economic downturns. The structural VAR and simulation of the labor market jointly determine that discretionary changes such as the introduction of more generous programs and lower barriers to entry for companies do not have a statistically significant effect on changes in unemployment. The final analysis determined that the short-time work system prevented a possible 1.29 percent increase in unemployment. However, the researchers acknowledge that German market pessimism during the bull economy and the relatively low cost of labor up to 2007 likely also played important roles in keeping unemployment low. The researchers further found that higher firing costs and union presence impacted the overall success of short-time work.

Efstathiou et al. (2018) composed a detailed microeconomic analysis on the short-time work trends in Luxembourg. From 2008-2009, and again from 2011-2015, Luxembourg had a sudden and rapid uptick in short-time work participation. Firms within the country heavily utilized the robust system to avoid hefty re-training costs and prevent the inefficient separation of productive workers during the crises. The authors utilized a survey that questioned Luxembourg firms on the qualitative and quantitative effects of short-time work involvement during the crisis period. The survey asked firms to identify how many individuals would have been laid off had the program been unavailable. The survey data determined that the program saved 4.3 percent of overall jobs during the peak months of the 2008 recession, and 4.9 percent of jobs during the Euro Crisis. The firms reported that approximately 25 percent of employees involved in short time work programs in 2008 would have lost their job without the program, and 20 percent of short-time workers' jobs were saved from 2011-2013.

Kopp and Siegenthaler (2017) utilize a differences-in-differences model at the firm level to observe the impact of short-time work take-up rate on unemployment in Switzerland. The authors recognize an inherent bias in firm-level studies towards companies more immediately in need of the program. This can thwart ceteris paribus comparisons by skewing the data towards companies that were struggling prior to the crisis period. Because more layoffs would be observed in these firms regardless, the measured impact of short-time work programs at the microeconomic level may appear lower. Due in part to this, the researchers find that macroeconomic country-comparison models tend to yield significant positive results between short-time work take-up rate and unemployment prevention, whereas firm-level studies often show little to no correlation. The researchers' results, however, provide very significant evidence that the short-time work programs prevented job loss in Swiss firms that were approved for the program. Notably, they discover that the direct fiscal benefits of program use, including reduced expenditure on unemployment benefits, may have been large enough to fully cover the cost of the program. The indication that the program paid for itself directly, excluding the indirect benefits of job security, prevention of inefficient separation, and aggregate demand benefits from the spending of retained employees, is very promising for future program design.

## 4.2 Comparative Studies

Abraham and Houseman (1994) are often credited as founders in the field of short-time work analysis for their utilization of a model of the dynamic demand for labor to compare the rate of structural adjustment in Germany, France, Belgium, and the United States. Their study conducts detailed measures of the impact of short-time work programs on the adjustment rate to shocks in demand. In order to collect the data for the three nations, the authors surveyed firms in the manufacturing sector to determine how the adjustments in hours would have differed without a short-time work program. They find that the German, French, and Belgian short-time systems all played an important role in national labor adjustment changes as a response to exogenous demand shocks. Their final results further suggest that job security protections like short-time work are compatible with labor market flexibility. The adjustment of hours is similar for countries with labor protections in place, though reactions to changes in output are much slower in more protected European countries than in the United States. Hijzen and Venn (2011) provide a thorough systematic evaluation of the impact of short-time work schemes on 19 OECD countries during the recession. The researchers use a differences-in-differences

approach in order to gauge short-time work take-up rate impact on employment and hours worked over a two-year period. Hijzen and Venn opt to use full-time equivalents rather than total number of participants, since this gives them the explanatory power to calculate the number of jobs potentially saved by the program. They note a significant bias towards medium and large firms in the take-up rate, as these firms have more resources available to meet eligibility and conditionality requirements. The researchers analyzed the impact of short-time work programs on both employment and average hours. Their results provide statistically significant evidence that short-time work programs played a role in preventing unnecessary unemployment over the recession, though these benefits were almost entirely restricted to full-time workers. However, the researchers were not able to obtain post-crisis data given the time of publication, so they were unable to determine whether the preservation of jobs held out in the long run.

Cahuc and Carcillo (2011) utilize OECD data to determine the consequences of short-time work programs on unemployment, employment, and hours. The researchers extend the Hijzen and Venn model further by accounting more directly for the endogeneity in take-up rates across countries. They use a regression model to estimate the impact of the short-time work take-up rate on the unemployment rate of 25 countries. The research finds that a one-percent increase in the short-time work take-up rate results in a 1.24 percent decrease in percent changes in unemployment, which is statistically significant at the five-percent level. The paper confirms previous studies on the topic which identify the success of short-time work programs in preserving jobs and consistently keeping unemployment down. However, this study was completed before the long-term post-recession effects could be fully measured. As a result, the duration of time under study is unable to display longer-term trends. Because of the scale of the demand shock, it was also challenging for the researchers to isolate short-time work effects while controlling for the numerous and diverse state programs created to counter the crisis. Though the crisis provides a prime case study with regards to program uptake, the researchers warn that the overall effects of short-time work could be easily drowned out by the size of the demand shock.

For the purposes of this study, I have opted to conduct a comparative analysis of the impact of short-time work on unemployment. The comparative analysis allows for wider applicability of the results through observation of a large number of countries. This method will allow for the exploration of greater trends in short-time work implementation, rather than limiting the results to the particular demographic and programmatic features of one country.

# 5 Methodology

The diverse range of techniques and methods for measuring the impact of short-time work on unemployment provides ample resources to extend the methods of study into the long run. As such, I have opted to utilize a comparative differences-in-differences model to observe more widely applicable trends in short-time work. In order to observe the impact of short-time work on unemployment in the years following a period of crisis, I exploit the variations in take-up rate across European countries over the period under observation. The data set utilizes annual observations from 2005 to 2015 in order to capture the crisis and post-crisis effects of the program. Seventeen countries are observed in this regression model. Of these countries, 14 have short-time work programs: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Norway, Portugal, Slovenia, and Spain; the Czech Republic, the Netherlands, and Poland all created short-time work programs during the crisis period (Cahuc and Carcillo 2011). Greece, Sweden, and the United Kingdom did not have national short-time work programs over the duration of the study. Hungary, Poland, Switzerland, and Luxembourg were removed from the study due to incomplete or insufficient data on national take-up rates.

For the purposes of this research, the take-up rate in countries without a national short-time work program is assumed to be zero. The United Kingdom did have firm-level programs that qualified statistically as short-time work models, but they applied to a small number of workers, operated as firm-specific schemes, and were not nationally implemented, and were therefore excluded from analysis. The model also includes only the data for workers ages 25-54. This excludes the potentially skewed impacts of both first entry into and final departure from the labor force. During recession periods, those entering the labor market are likely to become discouraged or depart from the labor market to receive more education, and older workers may be pressured to retire early. Elimination of those two groups should mitigate the distortive labor market shrinking effects of the recession.

This differences-in-differences analysis makes the necessary assumption that short-time work take-

up rate prior to the crisis was 0. Some countries utilized short-time work programs prior to the crisis period, however these programs were not capitalized upon to a significant degree until the beginning of the crisis. Most use was restricted to particular firms facing circumstantial downturns, and these very small take-up rates did not reflect systemic economic downturns. The only major exception to this is Belgium, where the national short-time work program was utilized heavily prior to the crisis (Hijzen and Venn 2011). I therefore provide numerical analysis excluding Belgium alongside my initial findings.

The impact of short-time work take-up rate is estimated using the following differences-in-differences model, derived from Hijzen and Venn (2011), Cahuc and Carcillo (2011), and Angrist and Pischke (2014):

$$\begin{gathered}\ln(unempl.) = \beta_0 + \beta_1 STW + \beta_2 GDP + \beta_3 CRISIS * STW + \\ \beta_4 STW * GDP + \beta_5 CRISIS * STW * GDP + \\ \sum_{n=17}^{i=1} \beta_i COUNTRY_1 + \sum_{n=10}^{i=1} \beta_i YEAR_i + \sum_{n=17}^{i=1} [\beta_i (COUNTRY) * t] + u\end{gathered} \tag{1}$$

With the null hypothesis that $\beta_5 = 0$. This model is based on a traditional differences-in-differences multi-country analysis, though it has been extended to include interactions with a model of elasticity of unemployment with respect to output. STW denotes the natural logarithm of the annual short-time work take-up rate of workers ages 25-54 by country. CRISIS denotes a dummy variable which equals 1 from 2009 onward, as the financial crisis impacted Europe during the first quarter of 2009 (Hijzen and Venn, 2011). GDP measures the natural logarithm of annual gross domestic product. The coefficient on the interaction between the crisis dummy, the short-time work variable, and output ($\beta_5$) contains the differences-in-differences effect in the equation by allowing comparison between countries with and without a short-time work scheme directly following the crisis period. This interaction term denotes the impact of a short-time work program on the responsiveness of the unemployment rate to an exogenous output shock (Hijzen and Venn, 2011).

In order to ensure that a fixed-effects model is the most consistent and efficient estimator for the parameters, I conducted a Hausman test, which compared the data under fixed- and random-effects models. The Hausman test operates on the null hypothesis that the fixed- and random-effects models are efficient and consistent estimators of the variables. The test resulted in a chi-squared value of 44.54 and a p-value of 0.00, a resounding rejection of the null hypothesis. I therefore utilized a fixed-effects model to control for country and time effects in regression 1. The complete regression outcome for the Hausman test can be found in the appendix.

The model also includes a control for inflation based on annual percent change in national CPI (OECD 2020) in order to control for inflationary impacts on the GDP variable. A control for the percentage of employees with the right to collective bargaining also remains in the model – this is in part because this value was time-variant and thus not fully captured by the fixed-effects model, and in part because its inclusion isolates the impact of the take-up rate increase from the lower unemployment fluctuation trends in countries that have higher labor protections outside of short-time work. The original specification model also included dummy variables for eligibility and conditionality requirements; however, a majority of these variables (5 of the 7 parameters) were perfectly correlated with the controls for country effects. These variables were therefore removed from the final analysis.

# 6 Results

## 6.1 Comparative Analysis of All Countries

Selected results from the regression analysis are included in Tables 2 and 3. These results were selected based on their relevance to the research question. The complete regression outcomes for all variables can be found in the appendix.

**Table 2: Selected Results of the Full Regression**

| Variable | Coefficient | Std. Error | Sig. Level |
|---|---|---|---|
| STW ($\beta_1$) | -0.1905447 | 0.2397206 | 0.428 |
| Output ($\beta_2$) | -1.671641 | 0.1999584 | 0 |
| Interaction between the Crisis Dummy and STW ($\beta_3$) | 0.1936395 | 0.1173714 | 0.101 |
| Interaction between Output and STW ($\beta_4$) | 0.0144601 | 0.0194211 | 0.458 |
| Interaction between Output, Crisis Dummy and STW ($\beta_5$) | -0.0138531 | 0.0089011 | 0.122 |
| R-Squared | 0.9307 | | |

Data obtained from OECD Labor Force Statistics (2020) and Eurostat (2020).

The results in Table 1 indicate a somewhat weak statistical correlation between the short-time work take up rate during a crisis and the percent change in unemployment. The data indicates that a one-percent increase in the short-time work take-up rate in response to an exogenous decrease in output is associated with a 0.013 percent decrease in the rate of change of unemployment. This suggests that countries with short-time work programs may be slightly less sensitive to major shocks to output than countries without such programs. However, we cannot reject the null hypothesis $\beta_5 = 0$ at the 10 percent level. It is worth observing that this coefficient is significantly smaller than the results from shorter time periods. This may be because the longer duration under observation allows for adjustments in the marketplace unrelated to short-time work programs, including economic recovery measures and innovation of new industries in the place of those that did not survive the crisis period. The large and varied marketplace changes have the potential to overwhelm the impact of short-time work, which is designed to help only a small subset of qualifying firms.

It is not particularly surprising that the coefficient on the crisis dummy and the take-up rate ($\beta_3$) is positive. During times of crisis, there is simultaneously higher take-up and higher unemployment. Cahuc and Carcillo (2011) also found a significant positive correlation between unemployment and the take-up rate, and they attribute this outcome to the endogeneity of short-time work. The researchers obtained a negative correlation after adjusting for a number of instrumental variables, including the particulars of national employment policy.

**Table 3: Full Regression Excluding Belgium (STW6)**

| Variable | Coefficient | Std. Error | Sig. Level |
|---|---|---|---|
| STW ($\beta_1$) | -0.7631645 | 0.3219417 | 0.019 |
| Output ($\beta_2$) | -0.5635311 | 0.2382018 | 0.019 |
| Interaction between the Crisis Dummy and STW ($\beta_3$) | 0.31777 | 0.1606079 | 0.05 |
| Interaction between Output and STW ($\beta_4$) | 0.064412 | 0.0259538 | 0.014 |
| Interaction between Output, Crisis Dummy and STW ($\beta_5$) | -0.0239516 | 0.0121748 | 0.051 |
| R-Squared | 0.9156 | | |

Data obtained from OECD Labor Force Statistics (2020) and Eurostat (2020).

Removing Belgium from the observed countries significantly impacts the results. The results in Table 2 are more significant for every statistic besides the coefficient on changes in output. We can now

reject the null hypothesis $\beta_5 = 0$ at the 10 percent level. This indicates that Belgium's heavy use of short-time work programs in the period before the crisis may make it incompatible with the necessary assumption that the pre-crisis take-up rate is 0. Because of this assumption, Belgium's take-up rate appears to increase rapidly after the onset of crisis rather than trending upwards for years prior to it, so the per-unit impact of short-time work may appear significantly lower in this country (Hijzen and Venn 2011).

## 6.2 Regional Analysis

In addition to the overall regression, I have included regionally divided regressions based on particular geographic clusters. These are designed to indicate whether certain regions had particularly different experiences with short-time work programs, or whether localized features may have potentially played a role in the outcome of short-time work schemes. These are not comprehensive, and they do not include every country in the original data set. They also do not intend to delineate any geographical or political relationship besides physical proximity. The Nordic and Baltic Countries data set contains the data for Finland, the Netherlands, Norway, Sweden, and Denmark. The Central and Southern Countries data set contains Austria, the Czech Republic, Germany, Italy, and Slovenia. The Northern and Western Countries data set contains Belgium, France, Ireland, Portugal, Spain, and the United Kingdom. Complete regression results can be found in the appendix.

**Table 4: Nordic and Baltic Countries**

| Variable | Coefficient | Std. Error | Sig. Level |
|---|---|---|---|
| STW ($\beta_1$) | 0.216865 | 4.295683 | 0.96 |
| Output ($\beta_2$) | -1.250107 | 0.8607548 | 0.158 |
| Interaction between the Crisis Dummy and STW ($\beta_3$) | -1.132582 | 2.029748 | 0.581 |
| Interaction between Output and STW ($\beta_4$) | -0.0230342 | 0.3421998 | 0.947 |
| Interaction between Output, Crisis Dummy and STW ($\beta_5$) | 0.0959497 | 0.1602168 | 0.554 |
| R-Squared | 0.9375 | | |

Data obtained from OECD Labor Force Statistics (2020) and Eurostat (2020).

**Table 5: Central and Southern Countries**

| Variable | Coefficient | Std. Error | Sig. Level |
|---|---|---|---|
| STW ($\beta_1$) | 0.1533106 | 0.236523 | 0.522 |
| Output ($\beta_2$) | 0.0736595 | 0.5790355 | 0.9 |
| Interaction between the Crisis Dummy and STW ($\beta_3$) | -0.1060238 | 0.2013859 | 0.603 |
| Interaction between Output and STW ($\beta_4$) | -0.0085481 | 0.0174208 | 0.627 |
| Interaction between Output, Crisis Dummy and STW ($\beta_5$) | 0.009436 | 0.01483 | 0.53 |
| R-Squared | 0.9564 | | |

Data obtained from OECD Labor Force Statistics (2020) and Eurostat (2020).

**Table 6: Northern and Western Countries**

| Variable | Coefficient | Std. Error | Sig. Level |
|---|---|---|---|
| STW ($\beta_1$) | 0.9220929 | 0.566124 | 0.112 |
| Output ($\beta_2$) | -1.380539 | 0.3375355 | 0 |
| Interaction between the Crisis Dummy and STW ($\beta_3$) | 0.312688 | 0.4833179 | 0.522 |
| Interaction between Output and STW ($\beta_4$) | -0.0645343 | 0.0418049 | 0.131 |
| Interaction between Output, Crisis Dummy and STW ($\beta_5$) | -0.0200633 | 0.0334387 | 0.552 |
| R-Squared | 0.9698 | | |

Data obtained from OECD Labor Force Statistics (2020) and Eurostat (2020).

The coefficient on the interaction term loses its explanatory power with the smaller data sets. No regional data set contains an interaction between output, the crisis dummy, and short-time work that rejects the null hypothesis at even the 50 percent significance level. These very low levels of statistical significance may in part be accredited to the use of annual data. Quarterly or monthly data, if available, may show clearer regional trends over the duration of study. The Northern and Western Countries data set also provides the only negative correlation between short-time work take-up rate and unemployment; this may be related to the statistical significance of output on unemployment in comparison to the other regional data sets.

While the regional analysis offers little information, most likely due to a lack of available data, it is notable that the impact of output on unemployment differs significantly by region. For the central and southern countries in the data set, the null hypothesis that the coefficient on unemployment is 0 cannot be rejected at any significance level; on the other hand, the Nordic and Baltic countries, as well as the Northern and Western countries, have more statistically significant impacts of output on unemployment. This may be due to a number of factors outside of this analysis, such as the reactivity of local and national governments. This information could have an effect on the efficacy of short-time work, as greater impacts of output on employment prior to the introduction of short-time work programs could cause the program-specific impacts to appear minimal in comparison.

## 6.3 Effects of Policy and Labor Demographics on the Take-Up Rate

The results in Table 1 and Table 2 indicate the possibility of a relationship between increases in the short-time work take-up rate and decreases in unemployment rate fluctuation. In this case, it is worth including additional information regarding factors that may influence national short-time work take-up rates. This section measures the impact of selected national policy and labor demographics on the take-up rate. The impact of labor demographics and national policies on the national short-time work take-up rate are measured through the following regression:

$$STW = \beta_0 + \beta_1 LABFOR + \beta_2 MANU + \beta_3 AGRO + \beta_4 SERV + \beta_5 UNION \\ \beta_i E_i + \beta_j C_j + u \tag{2}$$

With the null hypothesis that $\beta_1, \beta_2 \ldots \beta_n = 0$ In this regression, LABFOR indicates the size of the national labor force, MANU, AGRO, and SERV refer respectively to the natural logarithm of percentage of the labor force in manufacturing, agriculture and service, and UNION refers to the percentage of workers with collective bargaining power. The variable Ei is a binary variable indicating the presence of an eligibility requirement, and Ci is a binary variable indicating the presence of a conditionality requirement. The eligibility and conditionality requirements under observation are listed in Table 7.

The eligibility and conditionality requirements were derived from Hijzen and Venn (2011, 10). Program generosity is not included in this regression because countries significantly altered generosity measures over the duration of study. The equation also controls for GDP and inflation differences across countries. Complete regression results can be found in the appendix.

**Table 7: Selected Results for Policy and Labor Demographic Effects**

| Variable | Coefficient | Std. Error | Sig. Level |
|---|---|---|---|
| LABFOR | -8.81e-05 | 5.48e-05 | 0.11 |
| MANU | 0.7740697 | 0.4122748 | 0.062 |
| AGRO | -0.6802087 | 0.3570352 | 0.058 |
| SERV | -9.147639 | 2.475301 | 0 |
| UNION | 0.0082835 | 0.0056844 | 0.147 |
| E1: Justification of Economic Need | -1.099707 | 0.2777664 | 0 |
| E2: Social Partner Agreement | 1.770524 | 0.3178318 | 0 |
| E3: Workers Must be Eligible for Unemployment Benefits | 0.9417821 | 0.2743175 | 0.001 |
| C1: Firms Must Create a Recovery Plan | 3.122205 | 0.3552393 | 0 |
| C2: Firms Cannot Dismiss Workers under STW | 2.016011 | 0.4534536 | 0 |
| C3: Job-Search Requirement for Employees | 1.820068 | 0.2863801 | 0 |
| R-Squared | 0.6785 | | |

Data obtained from OECD Labor Force Statistics (2020) and Eurostat (2020).

The results in Table 7 provide a number of insights. First, the size of the labor force has an extremely small effect on take-up rate. This indicates that countries with smaller populations in the labor force experienced equivalent percentage changes in take-up rate to larger countries. This may be because the take-up rate is far more heavily influenced by the percentage of the labor force in the manufacturing sector than the scale of the labor force overall: the results indicate a 0.77% increase in the take-up rate for every 1% increase in the percentage of workers in manufacturing. This matches the findings of Hijzen and Venn (2011), which indicated a significantly higher take-up rate in manufacturing compared to all other sectors. In contrast, higher percentages of workers in the service industry show a negative correlation with the take-up rate. This is likely because the current design of short-time work programs is far less suited to this industry, as detailed in Section III.

The results further indicate that the first eligibility requirement, justification of economic need, has a negative effect on take-up rate. This may indicate that this eligibility requirement creates a preliminary hurdle of eligibility that causes fewer firms to enroll in short-time work programs. However, the other eligibility and conditionality requirements appear to be positively correlated with the take-up rate. This may be because countries with more robust programs tend to also have well-thought rules and regulations on implementation. More research is needed at the microeconomic level to determine if this result indicates a failure of the requirements to control take-up rate, or whether it is the marker of a successful and well-designed program that efficiently selects suitable firms.

The outcome of this regression heavily indicates that the composition of the labor force with respect to the manufacturing sector and the eligibility and conditionality requirements of short-time work programs have the potential to impact the short-time work take-up rate. Further studies regarding this matter could include more complex measures of program generosity in order to explore the impact of increased expenditure on take-up rate. Such studies could also explore which firms in particular are most impacted by eligibility and conditionality requirements. The current results do not offer much clarity on whether the requirements prevent inefficient retention or serve as a barrier to entry for small firms.

# 7 Conclusion, Analysis, and Potential for Further Research

The results of this data analysis affirm previous researchers' conclusions about the effect of short-time work programs on diminishing fluctuations in unemployment. It appears, however, that the impact of the program is dampened in the long run. This may be because the scale of many countries' short-time work programs is not yet large and comprehensive enough to accomplish the desired results to the fullest extent over the long run. As a result, unemployment impacts that appear larger in the short run are drowned out by the quantity and scale of long-run recovery efforts. However, the statistical analysis indicates that encouraging more widespread take-up of short time work may aid in further smoothing shocks to unemployment. In order to increase the generosity and scale of short-time work programs, states would necessarily need to dedicate more funds and resources to program operation. However, these trends indicate that such investments have a potential payoff in the form of continued employment and prevention of inefficient separations. The analysis in section 6.3 indicates that particular requirements have the potential to decrease short-time work take-up rates, while others trend positively with take-up; however, these statistics fail to indicate whether the requirements are succeeding in efficiently selecting the best-fitting firms. Future studies could explore the impact of eligibility and conditionality requirements on preventing moral hazard. A firm-level study could explore whether these requirements effectively sorted responsible firms from those who would abuse the program to avoid eliminating costly internal inefficiencies. This study could examine whether costly commitments, such as making firms foot a larger part of the bill for hours not worked, succeed in efficiently selecting firms for the program. However, such a study should observe whether the requirements result in an adverse selection of larger firms with more resources to meet them, thus inefficiently eliminating smaller firms that may need more assistance.

There are ample opportunities for further study on this matter. Future researchers could potentially utilize this information to determine the explicit and implicit costs of a short-time work program, such as the potential for inefficient retention and increased expenditure on labor, alongside its explicit and implicit benefits, such as boosting aggregate demand through job retention and improving perceptions of long-term job security. With this information, the researcher could explore optimal program design based on a particular nation's budget, resources, and existing programs. Another interesting extension would involve tracking the spending habits of workers who were preserved under a short-time work program in comparison to socioeconomically comparable workers who were laid off. This research could indicate the real impacts of short-time work on aggregate demand, thus providing more clarity on the potential economic benefits of increasing program generosity. Additionally, someone exploring the possible downsides of the program could examine the difference in unemployment duration between countries with and without short-time work schemes. Keeping employees in their jobs during economic downturns may have adverse effects on the ability of unemployed workers to find new openings after the recessionary period.

In the next few years, the data on short-time work programs during and after the COVID-19 global pandemic should become available. This will provide countless opportunities for analysis, program design, and further extension of the research. Short-time work's focus on decreasing hours, and thus exposure, uniquely fits the health and safety guidelines of the pandemic in companies that cannot conduct operations from home. This will hopefully offer ample opportunity for comparative analysis against the outcomes of the 2008 recession. Though short-time work is not a labor market panacea, it has the potential to become an important tool for nations to endure economic downturns and preserve employee security at a low cost to the employer. Even beyond the unique conditions of a global pandemic, the world economy is becoming both increasingly interlinked and significantly uneven. I therefore believe that national policies that offer protection, stability, and consistency in the face of rapid fluctuations and changes should be at the forefront of research and analysis. In the face of another potential market downturn and instability in every facet of modern life, perhaps potential stability deserves increased attention.

# 8 Appendices

## 8.1 Appendix A: Complete Data Output from Regression Analysis

**HAUSMAN TEST**

```
hausman fixed5 rand5, sigmamore
```

| | ---- Coefficients ---- | | | |
|---|---|---|---|---|
| | (b) fixed5 | (B) rand5 | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
| CRISIS | .6012894 | .2903416 | .3109478 | .047289 |
| NTUR2 | -.1693652 | -.7491683 | .5798031 | .1696799 |
| logGDP | -2.053967 | -.5977981 | -1.456169 | .2225202 |
| CRISISxNTUR2 | .0972804 | .2588889 | -.1616084 | .0366504 |
| CRISISxlog~P | -1.12e-08 | 7.57e-08 | -8.69e-08 | 1.46e-08 |
| NTUR2xlogGDP | .0165015 | .0634578 | -.0469563 | .0142283 |
| CRISISxNTU~P | -.0067164 | -.0201934 | .013477 | .0028873 |
| UNION | .002696 | -.0021662 | .0048621 | .0009775 |
| INFL | -.0665268 | -.0888108 | .022284 | .0040768 |
| T1 | .0649923 | -.0418722 | .1068645 | .0166005 |
| T2 | .0849767 | -.1183878 | .2033644 | .0310507 |
| T3 | -.4368684 | -.3633772 | -.0734912 | .0115186 |
| T4 | -.4710817 | -.3821018 | -.0889799 | .0145996 |
| T5 | .4568861 | .2198765 | .2370096 | .0358186 |
| T6 | -.0507486 | -.0212952 | -.0294534 | .006497 |
| T8 | .6346484 | .3013697 | .3332787 | .0505709 |
| T9 | .6144146 | .2274978 | .3869168 | .0586189 |
| T10 | .6328261 | .1649129 | .4679133 | .070931 |

```
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       44.54
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

```
ALL COUNTRIES
reg reg logURATE CRISIS NTUR2 logGDP CRISISxNTUR2 CRISISxlogGDP NTUR2xlogGDP CRISISxNTUR2
> xlogGDP BEL CZ DEN FIN FRA GER GRE IRE ITA NET NOR POR SLO SPA SWE UK TBEL TCZ TDEN TFIN
> TFRA TGER TGRE TIRE TITA TNET TNOR TPOR TSLO TSPA TSWE TUK UNION INFL T1 T2 T3 T4 T5 T6 T
> 7 T8 T9 T10

      Source |       SS              df      MS      Number of obs   =       187
-------------+------------------------------   F(50, 136)        =     59.18
       Model |   44.771975           50  .895439501   Prob > F        =    0.0000
    Residual |  2.05780573          136  .015130924   R-squared       =    0.9561
-------------+------------------------------   Adj R-squared   =    0.9399
       Total |  46.8297808    186  .251773015   Root MSE        =    .12301

------------------------------------------------------------------------------
      logURATE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
        CRISIS |          0  (omitted)
         NTUR2 |  -.1905447   .2397206    -0.79   0.428    -.6646067    .2835174
        logGDP |  -1.671641   .1999584    -8.36   0.000    -2.067071   -1.276211
  CRISISxNTUR2 |   .1936395   .1173714     1.65   0.101    -.0384697    .4257486
  CRISISxlogGDP |   3.56e-08   4.57e-08     0.78   0.438    -5.49e-08    1.26e-07
  NTUR2xlogGDP |   .0144601   .0194211     0.74   0.458     -.023946    .0528665
CRISISxNTUR2xlogGDP |  -.0138531   .0089011    -1.56   0.122    -.0314555    .0037493
         BEL |   22.34842   34.52953     0.65   0.519    -45.93583    90.63267
          CZ |   47.97684   33.97843     1.41   0.160    -19.21758    115.1713
         DEN |   -97.3589   33.61778    -2.90   0.004    -163.8401   -30.87769
         FIN |   9.104308   33.47927     0.27   0.786    -57.10297    75.31159
         FRA |  -1.503497    33.7087    -0.04   0.964    -68.16451    65.15752
         GER |   208.7159   33.5957     6.21   0.000     142.2783    275.1534
         GRE |  -130.5053   50.35582    -2.59   0.011    -230.087   -30.92362
         IRE |  -181.5428   34.78894    -5.22   0.000    -250.3401   -112.7456
         ITA |  -53.04505   34.60939    -1.53   0.128    -121.4872    15.39713
         NET |   -45.3418   33.78371    -1.34   0.182    -112.1511    21.46755
         NOR |  -75.65079   34.46601    -2.19   0.030    -143.8094   -7.492158
         POR |  -47.18713   34.89753    -1.35   0.179    -116.1991    21.82486
         SLO |  -114.4928    35.552    -3.22   0.002    -184.799   -44.18656
         SPA |   -139.048   35.54005    -3.91   0.000    -209.3306   -68.76538
         SWE |  -38.62706   33.99816    -1.14   0.258    -105.8605    28.60636
          UK |   10.99146   34.05369     0.32   0.747    -56.35179    78.33471
        TBEL |   -.010742    .017177    -0.63   0.533    -.0447106    .0232265
         TCZ |  -.0241741   .0168917    -1.43   0.155    -.0575785    .0092303
        TDEN |   .0483495   .0167247     2.89   0.004     .0152755    .0814236
        TFIN |  -.0047018   .0166587    -0.28   0.778    -.0376455    .0282419
        TFRA |   .0025338   .0167489     0.15   0.880    -.0305882    .0356558
        TGER |  -.1018528   .0167109    -6.10   0.000    -.1348996   -.0688061
        TGRE |   .0652076   .0250718     2.60   0.010     .0156265    .1147887
        TIRE |   .0903412   .0173198     5.22   0.000     .0560902    .1245921
        TITA |   .0280511   .0171748     1.63   0.105    -.0059131    .0620153
        TNET |   .0231505   .0167971     1.38   0.170    -.0100667    .0563677
        TNOR |   .0375086   .0171543     2.19   0.030     .003585 .0714322
        TPOR |   .0234647   .0173779     1.35   0.179    -.0109012    .0578306
        TSLO |   .0554446   .0177015     3.13   0.002     .0204388    .0904505
        TSPA |   .0707915   .0176489     4.01   0.000     .0358897    .1056934
        TSWE |   .0195246   .0169212     1.15   0.251    -.0139382    .0529873
        TUK |  -.0036933   .0169201    -0.22   0.828    -.0371538    .0297672
      UNION |   .0042221   .0020413     2.07   0.041     .0001852    .008259
       INFL |  -.0327611   .0124937    -2.62   0.010    -.0574681   -.008054
         T1 |   .0294662   .0465479     0.63   0.528    -.0625852    .1215175
         T2 |  -.0000836   .0563717    -0.00   0.999    -.111562     .1113949
         T3 |  -.0422713   .0868135    -0.49   0.627    -.2139503    .1294077
         T4 |    .044737   .0867517     0.52   0.607    -.1268199    .2162938
         T5 |   .3137613   .0799775     3.92   0.000     .155601 .4719216
---------------+--------------------------------------------------------------
         T6 |   .3077572    .106301     2.90   0.004     .0975406    .5179739
         T7 |   .3653925   .1158257     3.15   0.002     .1363401    .5944448
         T8 |   .4566178   .1126669     4.05   0.000     .2338123    .6794234
         T9 |   .4309627    .124812     3.45   0.001     .1841395    .677786
        T10 |   .4287798   .1394661     3.07   0.003     .1529771    .7045825
      _cons |   22.02896   2.460826     8.95   0.000     17.16252    26.89539
------------------------------------------------------------------------------
```

**NORDIC BALTIC**

```
. regress logURATE CRISIS NTUR2 logGDP CRISISxNTUR2 CRISISxlogGDP NTUR2xlogGDP CRISISxNTUR2
> xlogGDP DEN SWE NET NOR TDEN TSWE TNET TNOR UNION INFL T1 T2 T3 T4 T5 T6 T7 T8 T9 T10
note: T3 omitted because of collinearity

       Source |       SS             df      MS      Number of obs   =        55
-------------+------------------------------------   F(26, 28)       =     16.15
       Model |  7.28251682           26  .280096801   Prob > F        =    0.0000
    Residual |  .485697483           28  .017346339   R-squared       =    0.9375
-------------+------------------------------------   Adj R-squared   =    0.8794
       Total |  7.76821431           54  .143855821   Root MSE        =    .13171

------------------------------------------------------------------------------
       logURATE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------+---------------------------------------------------------
              CRISIS |  -.7530304   .7189456    -1.05   0.304    -2.225724    .7196629
              NTUR2 |  .216865   4.295683     0.05   0.960    -8.582443    9.016173
              logGDP |  -1.250107   .8607548    -1.45   0.158    -3.013283    .5130695
       CRISISxNTUR2 |  -1.132582   2.029748    -0.56   0.581    -5.290332    3.025169
       CRISISxlogGDP |   6.55e-07   1.85e-06     0.35   0.726    -3.14e-06    4.45e-06
       NTUR2xlogGDP |  -.0230342   .3421998    -0.07   0.947    -.7239987    .6779303
CRISISxNTUR2xlogGDP |   .0959497   .1602168     0.60   0.554    -.2322395    .4241389
              DEN |  -118.5237   36.93069    -3.21   0.003    -194.1728   -42.87458
              SWE |  -28.13249   79.31772    -0.35   0.725    -190.6075    134.3425
              NETH |  -118.5237   36.93069    -3.21   0.003    -194.1728   -42.87458
              NOR |  -33.21239   60.49063    -0.55   0.587    -157.1218    90.69704
              TDEN |   .0589518   .0183729     3.21   0.003    .0213166    .096587
              TSWE |   .0142978   .0394693     0.36   0.720    -.0665515    .095147
              TNET |   .0589518   .0183729     3.21   0.003    .0213166    .096587
              TNOR |   .0163312   .0301868     0.54   0.593    -.0455038    .0781661
              UNION |  -.0054732   .0134243    -0.41   0.687    -.0329717    .0220252
              INFL |   .0542031   .0395047     1.37   0.181    -.0267186    .1351248
              T1 |  -.1841067    .113993    -1.62   0.118    -.4176107    .0493973
              T2 |  -.3125494   .1422915    -2.20   0.036    -.6040203   -.0210786
              T3 |           0  (omitted)
              T4 |   .4806426    .156196     3.08   0.005    .1606896    .8005955
              T5 |   .1400906   .1891849     0.74   0.465    -.2474371    .5276183
              T6 |   .547212   .1002566     5.46   0.000    .3418457    .7525782
              T7 |   .6187539   .1185247     5.22   0.000    .3759671    .8615407
              T8 |   .239769   .2406714     1.00   0.328    -.253224    .732762
              T9 |   .2418028    .26455     0.91   0.369    -.3001033    .7837089
              T10 |   .2796147   .2652687     1.05   0.301    -.2637637    .8229931
              _cons |   17.61919   10.37919     1.70   0.101    -3.641627    38.88
------------------------------------------------------------------------------
```

**CENTRAL SOUTHERN**

```
regress logURATE NTUR2 logGDP CRISISxNTUR2 CRISISxlogGDP NTUR2xlogGDP CRISISxNTUR2xlogGDP
>  CZ GER ITA SLO TCZ TGER TITA TSLO UNION INFL T1 T2 T3 T4 T5 T6 T7 T8 T9 T10

       Source |       SS             df      MS      Number of obs   =         55
-------------+------------------------------------   F(26, 28)       =      23.61
       Model |   4.7232499           26  .181663458   Prob > F        =     0.0000
       Residual |  .215456913        28   .00769489   R-squared       =     0.9564
-------------+------------------------------------   Adj R-squared   =     0.9159
       Total |  4.93870682           54  .091457534   Root MSE        =     .08772

------------------------------------------------------------------------------
       logURATE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------+---------------------------------------------------------
              NTUR2 |   .1533106    .236523     0.65   0.522    -.3311849      .6378061
              logGDP |   .0736595   .5790355     0.13   0.900    -1.112441      1.25976
       CRISISxNTUR2 |  -.1060238   .2013859    -0.53   0.603    -.5185441      .3064964
       CRISISxlogGDP |  -5.11e-08   5.99e-08   -0.85   0.401    -1.74e-07      7.15e-08
       NTUR2xlogGDP |  -.0085481   .0174208    -0.49   0.627    -.0442329      .0271368
CRISISxNTUR2xlogGDP |  .009436     .01483      0.64   0.530    -.0209419      .0398139
              CZ |   82.33134   28.69333     2.87   0.008    23.55571       141.107
              GER |   192.7497      25.4361     7.58   0.000    140.6462       244.8532
              ITA |  -122.3213   32.79892    -3.73   0.001    -189.5069     -55.13575
              SLO |  -129.1904   40.40677    -3.20   0.003    -211.9599     -46.42086
              TCZ |  -.0406527   .0141792    -2.87   0.008    -.0696974     -.0116079
              TGER |  -.0957109   .0126357   -7.57   0.000    -.1215939     -.0698279
              TITA |   .0610735   .0159921    3.82   0.001    .0283152       .0938317
              TSLO |   .0646569   .0200915    3.22   0.003    .0235014       .1058124
              UNION |   .0050627   .0040627     1.25   0.223    -.0032593      .0133847
              INFL |  -.0611437   .0350469    -1.74   0.092    -.1329341      .0106466
              T1 |  -.0724733   .0713467    -1.02   0.318    -.2186205      .0736738
              T2 |  -.1737677   .0990699    -1.75   0.090    -.3767031      .0291678
              T3 |  -.2137727   .1387956    -1.54   0.135    -.4980827      .0705372
              T4 |  -.2557965     .170387   -1.50   0.144    -.6048184      .0932255
              T5 |  -.0905396   .1409912    -0.64   0.526    -.3793469      .1982677
              T6 |  -.0850442   .1631506    -0.52   0.606    -.4192431      .2491546
              T7 |  -.0044973   .1648933    -0.03   0.978    -.3422659      .3332712
              T8 |   .0418313   .1691804    0.25   0.807    -.3047192      .3883817
              T9 |  -.0212102   .1979698    -0.11   0.915    -.4267329      .3843126
              T10 |  -.1108712   .2304809    -0.48   0.634          -.58299 .3612476
              _cons |   .1661936   7.127105     0.02   0.982    -14.43302      14.76541
------------------------------------------------------------------------------
```

**NORTHERN WESTERN**

```
regress logURATE CRISIS NTUR2 logGDP CRISISxNTUR2 CRISISxlogGDP NTUR2xlogGDP CRISISxNTUR2
> xlogGDP TFRA TIRE TPOR TSPA TUK FRA IRE POR SPA UK

       Source |       SS              df         MS   Number of obs   =        66
--------------+----------------------------------   F(17, 48)        =     36.79
       Model |  13.5785493            17  .798738195   Prob > F        =     0.0000
    Residual |  1.04206993            48   .02170979   R-squared       =     0.9287
--------------+----------------------------------   Adj R-squared   =     0.9035
       Total |  14.6206193            65  .224932604   Root MSE        =     .14734

------------------------------------------------------------------------------
       logURATE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+-------------------------------------------------------------
          CRISIS |   -.110143   .2683323    -0.41   0.683    -.6496614    .4293753
          NTUR2 |   1.405406   .6515388     2.16   0.036     .0953993    2.715412
          logGDP |  -1.148658   .2951428    -3.89   0.000    -1.742082   -.5552334
   CRISISxNTUR2 |   .2335512   .6165224     0.38   0.706    -1.00605     1.473153
   CRISISxlogGDP |   6.41e-08   1.41e-07     0.46   0.651    -2.19e-07    3.47e-07
   NTUR2xlogGDP |  -.0923733    .047962    -1.93   0.060    -.1888074    .0040608
CRISISxNTUR2xlogGDP |  -.0154281   .0428518    -0.36   0.720    -.1015875    .0707312
          TFRA |   .0604195   .0149504     4.04   0.000     .0303596    .0904793
          TIRE |   .1330448   .0160844     8.27   0.000     .100705    .1653846
          TPOR |   .0523188   .0164399     3.18   0.003     .0192642    .0853734
          TSPA |   .1375144   .0142884     9.62   0.000     .1087856    .1662431
          TUK |   .0458918   .0146363     3.14   0.003     .0164635    .0753201
          FRA |  -119.0853   29.89755    -3.98   0.000    -179.1984   -58.97229
          IRE |  -268.0481   32.41307    -8.27   0.000    -333.2189   -202.8772
          POR |  -105.9333   33.06675    -3.20   0.002    -172.4184   -39.44815
          SPA |  -274.4665   28.67121    -9.57   0.000    -332.1139   -216.8192
          UK |   -90.089   29.29248    -3.08   0.003    -148.9855   -31.19252
        _cons |   16.12078   3.847475     4.19   0.000     8.384917    23.85665
```

**POLICY AND DEMOGRAPHIC IMPACT**

```
.  regress NTUR2 LABFOR logPERMANU logPERAGRO logPERSERV UNION INFL GDP E1 E2 E3 C2 C3 C4

      Source |       SS           df       MS      Number of obs   =       187
-------------+----------------------------------   F(13, 173)      =     28.09
       Model |  425.885612        13  32.7604317   Prob > F        =    0.0000
    Residual |   201.78447       173  1.16638422   R-squared       =    0.6785
-------------+----------------------------------   Adj R-squared   =    0.6544
       Total |  627.670082       186  3.37457033   Root MSE        =      1.08

------------------------------------------------------------------------------
       NTUR2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      LABFOR |  -.0000881   .0000548    -1.61   0.110    -.0001963    .0000201
  logPERMANU |   .7740697   .4122748     1.88   0.062    -.0396664    1.587806
  logPERAGRO |  -.6802087   .3570352    -1.91   0.058    -1.384915    .0244972
  logPERSERV |  -9.147639   2.475301    -3.70   0.000    -14.03332   -4.261962
       UNION |   .0082835   .0056844     1.46   0.147    -.0029362    .0195033
        INFL |   .0202941   .0586164     0.35   0.730    -.0954013    .1359894
         GDP |   1.04e-06   8.25e-07     1.27   0.207    -5.83e-07    2.67e-06
          E1 |  -1.099707   .2777664    -3.96   0.000    -1.647954   -.5514593
          E2 |   1.770524   .3178318     5.57   0.000     1.143197    2.397851
          E3 |   .9417821   .2743175     3.43   0.001      .400342    1.483222
          C2 |   3.122205   .3552393     8.79   0.000     2.421044    3.823366
          C3 |   2.016011   .4534536     4.45   0.000     1.120998    2.911025
          C4 |   1.820068   .2863801     6.36   0.000     1.254819    2.385317
       _cons |   37.92422   10.94822     3.46   0.001     16.31493     59.5335
------------------------------------------------------------------------------
```

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