Local labor market resilience: evidence from the French Air Force base closures

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ABSTRACT

This paper estimates how effects of demand shocks vary with local labor market conditions. Therefore, we estimate the effect on local unemployment of 14 air force base closures occurring between 2003 and 2014. We use common factor panel and synthetic control methods to construct a credible "counterfactual" for each employment zone which experienced a closure. By analyzing quarterly local unemployment data, we show that air base closure increase local unemployment. Common factor panel shows that air base closure lead to a rise in local unemployment in quarters following the shock. Synthetic control method reveals heterogeneity in local economy's resilience. In line with Glaeser et al. (2014), our quantitative analysis shows that disparity in human capital stock is the most relevant explanation for the observed heterogeneity in resilience.

Keywords: Labor market shocks; Resilience; Common factor panel; Synthetic control; Heterogeneous effects; Urban-Rural gradient.

INTRODUCTION

Despite its political relevance, there is very few studies analyzing how local economic conditions shape the effects of shocks (Bartik, 2014). The main goal of this paper is to better understand how local economies react after recessionary shocks. How local characteristics shape the resilience of local economies? Why particular regions display particular types of resilience? In particular we focus on the role of density and local human capital stock.

When a negative local shock occurs, the characteristics of the local market are detrimental on individual's trajectory. For instance, Holm and Olesen (2012) show that after the closure of shipyards in Denmark, individuals are confronted to different possibilities for finding new jobs depending on where they are located.

This paper contributes to the emerging literature on regional resilience. To the best of our knowledge, there is very few study assessing how regional factors shape local resilience. In this paper, we focus on two features put forward by the literature that explain observed heterogeneity in recovery after a negative shock: urban size and difference in human capital endowment.

Diodato and Weterings (2014) using a computable general equilibrium model show that labor market centrally oriented and service oriented regions, have on average, a higher recovery speed irrespective of the type of shock hinting the economy. Capello et al. (2015) explore the spatial heterogeneity in the costs of the economic crisis. Using a quantitative forecasting model, they show that urban size give greater resilience to regions hosting them through: the quality of production factors hosted, the density of external linkages, and the quality of urban infrastructure. At the microeconomic level, Combes et al. (2015) show that firms in central regions experience a better recovery after a macroeconomic shock. Large cities are less dependent to sector's specific economic slowdown, due to a rich pattern of specialization.

Glaeser et al. (2014) argue that education shape local resilience. They build a microeconomic model suggesting that the impact of skills on growth will differ depending on local economic conditions. To address this issue they endogenize production of new idea through an individual utility function: all workers are endowed with one unit of time that they can spend working or engaging in the production of new idea. In their model, skilled workers are more likely to be successful entrepreneurs (and hence produce idea). Therefore, cities better dotted in terms of human capital are more willing to reinvent themselves after an economic downturn.

Tackling the endogeneity of local demand for work is one the main issue in the labor market literature. To address this challenge Bartik (1991), instruments local change in employment by applying national industrial level growth rates to the local sectoral composition in the pre-period. Another strand of the literature, address this issue by exploiting shocks to local labor such as: natural disasters (Vigdor (2008) for instance), energy prices (Black et al., 2002) or variation in import exposures (David et al., 2013). Our paper contributes to this second strand of literature by studying the impact of air base closure on local unemployment. In this paper, we analyze the regional resilience pattern, by exploiting a shift in local demand: the Air Force Base closures occurring in France between 2003 and 2014. The end of the cold war in the 90's completely redesigned the French defense policy, and lead to a mass reduction in defense's budget. For instance between 2008 and 2015, the government schedule the cuts of 54.000 post in French army (livre blanc sur la Défense et la Sécurité Nationale, 2008). Air base closures provide a good empirical design to respond our problematic. First, due to the spatial concentration of military staff spillovers between local markets must be reduced. Second, due to national public procurement rules, the recessionary impact on local economy is only mediated by a reduction of private consumption of military personnel and their families. The reduced link between military base and local productive sphere allow the identification of symmetric shock between area. This analysis raises the crucial question regarding endogeneity of air base closure's decision. We use a common factor panel Bai (2009) and synthetic control Abadie et al. (2010) methods to control accurately endogeneity due to unobserved confounder and spatial correlation.

By analyzing quarterly local unemployment data, we show that air base closures increase local unemployment. Common factor panel regressions show a rise in local unemployment in quarters following the air base closure. Negative impacts disappear on average after eleven quarters. This analysis suggests that negative shock due to air base closure is on average transitory. But, quantitative case studies using synthetic control method shows that territories display very heterogeneous recovery paths. While some area seems not significantly impacted by air base closure, or seems to recover very quickly, other seems to diverge from their prior long-term unemployment path. Our quantitative analysis shows that disparity in human capital stocks is the most relevant explanation for the observed heterogeneity in resilience. This finding has important political implications because it shows that government intervention after negative downturn should be differentiated between areas.

In the next section, we briefly review the literature studying the demand shocks effects on local labor market resilience. In the section 2, we present the demand shock on which we focus in this paper: the air base closures in France. In the section 3, we present the estimation strategy we use. We present the data (section 4) and the results (section 5). Finally, the section 6 concludes.

1 REVIEW OF LITERATURE: DEMAND SHOCKS AND LOCAL LABOR MARKET RESILIENCE

It is only very recently that the notion of regional resilience has attracted attention from regional scientists. Regional resilience focus on the reaction of a local economy hit by a major shocks or a disruption. Resilience refers to its Latin root: *resilire* which mean to recover (Fingleton et al., 2012). This strand of literature considers three interpretations of this concept (Martin, 2012). The first one, is borrowed from physical science and it's linked to the ability of a system to return to its assumed stable equilibrium state following a shock. This approach reflects the notion of 'self-restoring equilibrium dynamics' developed in economy. According to this notion, the economy fluctuates around an unique steady state, and 'self-correcting' market mechanisms operate to restore the ex-ante equilibrium (Martin and Sunley, 2014). The second one refers to ecology. 'Ecological resilience' refers to the extent to which a shock can be absorbed by a local stable domain before it is induced into some other stable equilibrium (Holling, 1973). A parallel can be found with the notion of hysteresis developed in economic literature. When a market is hit by a shock, the economy does not return to its pre-shock state, but its pushed to a new path (Martin and Sunley, 2014). The last one opts for an adaptive view of resilience. The adaptive resilience is the ability of a system to minimize the impact of a destabilizing shock (Martin, 2012). This idea, is more expansive than, the other two definitions, it covers the notion of rebound from a shock (Martin and Sunley, 2014).

Despite this growing methodological literature, theoretical and empirical studies on determinants of regional resilience are still limited. Using a Seemingly Unrelated Regression (SUR) model, Fingleton et al. (2012) show that resilience varies between NUTS-1 UK regions. UK regions differ mainly in terms of the resistance of shocks and less in terms of the recovery from these shocks. Diodato and Weterings (2014) explore the role of interactions among firms and workers. They assess the recovery process at the regional levels, using a matching framework. The speed of recovery depends on the initial amplitude of the shocks, the skill-relatedness between sectors and the connectivity between regions. They simulate a shock in which every sector, in every Dutch regions, experiences a reduction by 5% in sales of final products, while the demands from the rest of the world remains stable. Regions specialized in services experience the greatest output reduction, while regions more manufacturing oriented are more resilient to this internal shock. But regions specialized in service experience faster recovery due to a better connectivity with other regions (give laid-off employees more opportunities to find a job without having to move), and a better relatedness with other between activities (competences needed for this activities are easily interchangeable). Capello et al. (2015) explore a problematic very close to ours: assessing the role of cities and urban systems as sources of regional resilience. Therefore they used very different methodology, by implementing *quantitative foresight*. Their foresight shows that cost of the 2008's crisis is considerably lower for the regions where large cities are present. Cities showing the highest economic resilience are cities hosted higher value-added activities, with higher quality of factors production, higher density of external linkages and network and good infrastructure.

Regarding the relation between human capital endowment and resilience, Glaeser et al. (2014) argue that education shape local recovery. Their model suggests that skills are particularly detrimental to local growth in period of adverse shocks. They focus on the history of two American cities: Detroit and Boston. Both cities experienced an industrial boom in the late 19th and early 20th centuries, and a big downturn after 1945. Despite this common history today Detroit and Boston experienced very different standard of living. Glaeser et al. (2014) argue that this divergence in the growth path among the two cities is related to the difference in human capital. Education level is the primary differentiating factor between Detroit and Boston, and since 1970 Boston has been able to reinvent itself around idea-intensive industries. They build a model suggesting that the impact of skills on growth will differ depending on local conditions. To address this question they endogenize the production of new idea, through an individual utility function: all workers are endowed with one unit of time that they can spend either working or engaging in the production of new idea (entrepreneurial activity). They made the assumption that skilled workers are more likely to be successful entrepreneurs (and hence produce idea). In their model human capital is particularly useful in times of economic downturn.

The literature on local labor shocks have reached varied finding on whether effects of shocks are persistent or transitory. Bartik (1991) tackles endogeneity of local demand shocks. He instruments local labor demand shocks by interacting cross-sectional differences in industrial composition with national changes in industry employment. Bartik (1991) finds significant effects of a shift in demand for labor. Long run effects are similar to short run effects regarding labor force participation and wages. Long-run effects are also found on unemployment, but lower than short-run effects. Blanchard et al. (1992) using a different specification than Bartik (1991), find different results. Contrary to Bartik (1991), their estimated impact on unemployment is transitory, and return to zero after 5 or 6 years. They show that a state return to normality after a shock not due to an increase in employment, but because workers leave affected states. Gathmann et al. (2014), studying mass lay off in Germany, argue that only a small share of the adjustment is reflected in higher unemployment rates. In contrast, return to equilibrium comes from reduced inflows into regions hit by a negative shocks. Bartik (2014) shows that the reduction of unemployment is more important after positive shocks in a distress area than in a prosperous local economy.

2 EXPLOITING A SHIFT IN LOCAL DEMAND FOR WORK: AIR FORCE BASES CLOSURES

French Army has experienced many changes since the end of the cold war. French Borders are not directly threatened since the breakup of the Warsaw Pact. This unprecedented situation lead to a decrease on national budget devoted to Army (to 3% of GDP in 1982 to 1.7% in 2011 (Foucault, 2012). This structural change regarding international security context lead to a decrease in military personnel staff. For instance between 2008 and 2015, the government schedule the cuts of 54.000 posts (livre blanc sur la Défense et la Sécurité Nationale, 2008). In addition to this quantitative decrease, we observe a reallocation of defense spending within national borders, because area of potential conflict shift from the north east part of the country to the south (closer to overseas operations). These significant structural changes lead to the closure of military facilities. The design of our study avoids some confounding effects. First, military personnel are very spatially concentrated. Therefore a base closure induces negative shocks on local demands. Due to the spatial concentration of military staff, spillovers between local markets must be reduced. Second, unlike companies in the private sector, military bases interact little with other local economic actors. Materials and most services depend on national centralized markets. The impact of base closure must have a recessionary impact on local economy through decline in private consumption of military personnel and their families. Therefore the negative stimulus on local economy seems disconnected from local characteristics (industrial specialization in particular).

Papers studying the impact of military activity on local labor market are very scarce, and they find non-significant or very reduced impact (Hooker and Knetter, 1997), (Hooker and Knetter, 2001), (Krizan, 1998). To the best of our knowledge, Hooker and Knetter (1997) is the first paper assessing quantitatively the impact of military spending on local economy. They find a negative non linear relationship between military spending and local employment. Hooker and Knetter (2001) using a differences-in-differences approach, shows that employment cost due to base closure are mostly limited to the direct job loss associated with military transfers, and local multiplier estimated is less than one. Dahlberg et al. (2013) find no effect in unemployment or employment but they estimate a decline in income for displaced people following a base closure. Nakamura and Steinsson exploit variation in military procurement spending across US states and regions to estimate open economy relative multiplier. Aus Dem Moore and Spitz-Oener (2012) shows that the realignment of the U.S forces in Germany have significant negative effects on local private sectors. Their dynamics analysis shows that negative shocks have permanent effects on local economy prosperity. Zou (2013) estimates that cutting military expenditure in United-Sates, by one reduces about 0.4 job in the private sector in the same county in the contemporaneous year, and 1.2 jobs cumulatively.

3 EMPIRICAL STRATEGY

Air base closure leads to an economic downturn for local market. We represent this shock by a linear common factor model:

$$U_{it} = \alpha_i I_t D_i + \beta X_{it} + f_t^{'} \lambda_i + \varepsilon_{it} \tag{1}$$

Where U_{it} stands for local unemployment rate in zone $_i$ at time $_t$, I_t and D_i is treatment dummy, X_{it} a set of covariates, $f_t^{'} \lambda_i$ correspond to factor model, and ε_{it} is an idiosyncratic error terms. We use common factor panel and synthetic control methods to construct a credible "counterfactual" for each employment zone which experienced a closure.

A key issue in our analysis is that even if base closure decisions are linked to international security context, they are made by political leader. This political dimension may result in a correlation between air base closure and outcomes because of the presence of unobservable (degree of political connection for instance). Second, the issue of spatial dependence between local units is important in the evaluation of regional intervention. Outcomes are likely to be spatially correlated in addition to the more usual issue of serial correlation in panel data. There is thus a need for a better control of spatial dependence and more generally of cross-section dependence when evaluating regional policies. Interactive effect models facilitate the control for cross-section dependence not only because of spatial correlations but also because areas can be close in economic dimensions which depart from purely geographic characteristics (Gobillon and Magnac, 2014).

3.1 Interactive effects Models

Despite their relevance interactive effects models are still barely used in regional economic (Gobillon and Magnac (2014) and Kim and Oka (2014) as exception). Interactive effects models are very appealing because unobservable individual effects are allowed to have heterogeneous individual time trends. It is an interesting property because it provides dissimilar reaction after a shock. This model allows unobservable characteristics to be multidimensional, and many types of interference between units. Similar to Bai (2009), we specify the unemployment rate in the absence of base closure as a function of the interaction between factors varying over time and heterogeneous individual terms called factors loadings. This specification may be expressed as:

$$U_{it}(0) = x_{it}\beta + f_t^{/}\lambda_i + \varepsilon_{it} \tag{2}$$

β stands for the effects of covariates on unemployment, λ_i is a $L \times 1$ vector if individual effects or factor loadings, and f_{lt} is a $L \times 1$ vector of time effects or factors. λ_{it} are unobserved individual loading parameters, f_{lt} are unobserved common factors. From the equation (2), the potential unemployment level with a base closure is:

$$U_{it}(1) = x_{it}\beta + f_t^{/}\lambda_i + \alpha_{it} + \varepsilon_{it} \tag{3}$$

with α_{it} which represent the average effect of the base closure.

One of the major issues in implementing factors models is the determination of the number of factors. We use the dimension criterion sets by Bai and Ng (2002). This test seems to perform very well, especially when the idiosyncratic errors are cross-correlated (Bada and Liebl, 2014).

3.2 The Synthetic Control Method

The Synthetic Control Method (SCM) was first proposed by Abadie and Gardeazabal (2003). There is a growing number of applications of this method, in health economics, regional and urban economics (Pinotti, 2012), political analysis (Abadie et al., 2010) and environmental economics. This method is very attractive because it introduces causal inference for case studies analysis (Abadie et al., 2010). SCM allows the evaluation of reforms even when a single unit is affected. But, the main interest of SCM, is that it reproduce accurately the evolution of the unit treated from an optimal combination of unaffected units.

We use the SCM to construct a specific counterfactual for each employment zone which experienced a closure. The counterfactual is a combination of unaffected employment zone supposed to better depict the characteristics of the affected unit of interest. The difference between the observed outcome in the treated areas and that observed for a weighted average of donors represents the causal effects of air base closures. More formally, the weights is chosen to minimize a penalty function that depends on the pre-intervention pattern of the outcome variable and a number of its predictors. Following Abadie et al. (2010), we observe $J+1$ employment zone. Only the first zone experienced a base closure, so J zones compose our potentials controls. Let U_{it}^{0} be the potential unemployment that would be observed for zone i (with $i = 1, ..., J+1$) at time t (and $t = 1, ..., T$) in the absence of base closure, and U_{it}^{1} be the potential unemployment if the regions experienced an air base closure. Let T_0 be the number of pre-intervention periods with $1 < T_0 < T$. We assume that air base closure has no impact on unemployment before T_0. The usual assumption of no interference between units is maintained, therefore we assume that unemployment in potentials controls zone is not affected by closure in zone 1. Let $\alpha_{it} = U_{it}^{1} - U_{it}^{0}$ be the potential effect of the intervention for units i at time t, and D_{it} be an indicator that takes the value one if the units exposed to the intervention at time t, and value zero otherwise. Then the observed unemployment in the affected region can be written as:

$$U_{it}^{1} = U_{it}^{0} + \alpha_t D_{it} \tag{4}$$

But U_{it}^{0} is not observed and Abadie et al. (2010) suggests estimating U_{it}^{0} with:

$$\widehat{\alpha}_t = U_t^{1} - \sum_{j=2}^{j} w_j U_{it} \tag{5}$$

for $t > T_0$ where weights W_j are chosen to minimize a certain penalty function (given by the Mean Squared Prediction Error – MSPE) that depends on the past unemployment and some other predictors. This penalty functions may be expressed as follows:

$$\sum_{m=1}^{k} (v_m(X_{1m} - X_{0m}W) \tag{6}$$

where v_m reflects the importance we assign to $m-th$ variable. As argued by Kaul et al. (2015) it is crucial that the synthetic control unit provides a good approximation to how the outcome of interest would have developed if no treatment had taken place. It has become increasingly popular in applications of synthetic control methods to include the entire pre-treatment path of the outcome variable as economic predictors (see Billmeier and Nannicini (2013) for instances). Kaul et al. (2015) demonstrate both theoretically and empirically by analyzing examples from the literature that using all outcome lags as separate predictors renders all other covariates irrelevant (i.e vm equal zero).This meant that only the pre-treatment fit with respect to the variable of interest is optimized. Kaul et al. (2015) argued that this might lead to biased estimations results, economic interpretations may be impacted. To deal with this comment we test four specifications:

1. in the first specification we only introduce lagged unemployment in the penalty functions. We include the entire pre-treatment path of the unemployment as economic predictors (from 2003 until air base-closure).

2. in the second specification we use the entire pre-treatment path of the unemployment and the mean over the pre-treatment period for each covariates described in section 4

3. in the third specification we include only the average of the pre-intervention unemployment in addition to the set of covariates.

4. in the last specification we introduce the set of covariate and last pre-treatment unemployment (the last five quarter more precisely) as value as additional predictor.

4 DATA

Our data set consists of quarterly unemployment series for 304 French employment zone (we exclude from our sample the French overseas departments) for the period 2003-2015. An employment zone is a geographical area defined by the French National Institute of Statistics (INSEE).This area is a zone within which most of the labor force lives and works, and in which establishments can find the main part of the labor force necessary to occupy the offered jobs. The division into employment zones provides the most relevant breakdown of the territory to study local unemployment.

We collect all air base closure episodes occurring between 2003 and the first quarter of 2015. We include all this air base closure in our interactive effect model. However, we do not present in this document synthetic control for three cities because pre-treatment period is too small to obtain a good counterfactual (Rennes and Aix-en-Provence) or post-treatment period is too short to identify an effect of air base closure (Châteaudun).

Table 1. Air Base Closure between 2003 and 2014

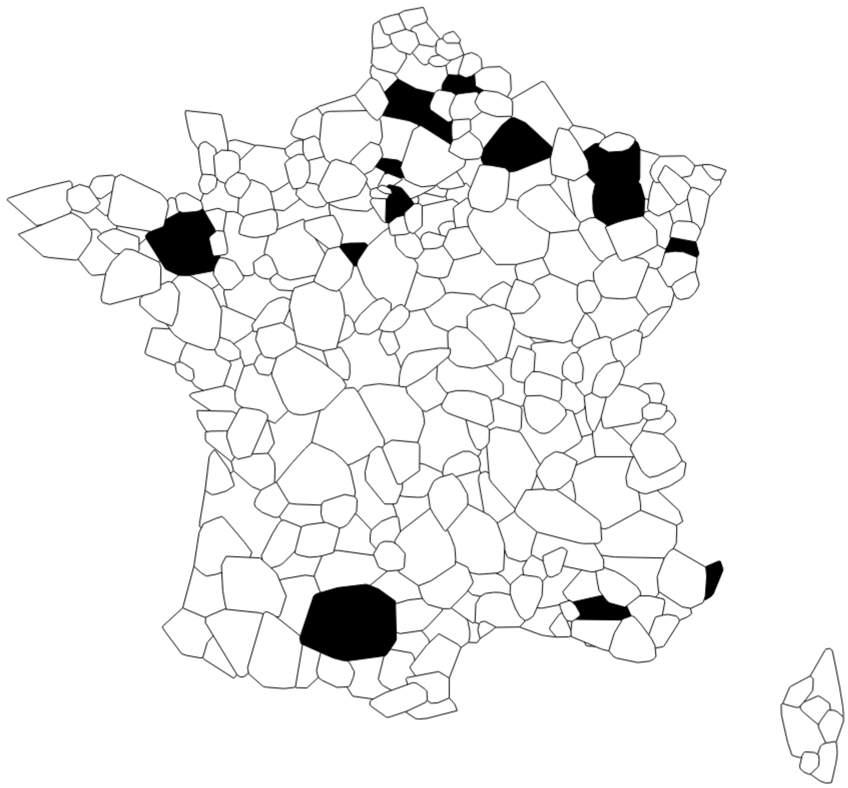
City	Employment Zone	Air Base Name	Date of Closure
Toulouse	Toulouse	BA 101 Toulouse-Francazal	September 2009
Cambrai	Cambrai	BA 103 Cambrai-Épinoy	June 2012
Reims	Reims	BA 112 Reims-Champagne	June 2011
Aix-en-Provence	Aix-en-Provence	BA 114 Aix-Les-Milles	June 2003
Metz	Metz	BA 128 Metz-Frescaty	June 2012
Colmar	Colmar	BA 132 Colmar-Meyenheim	June 2010
Toul	Toul	BA 136 Toul-Rosières	August 2004
Brétigny-sur-Orge	Saclay	BA 217 Brétigny-sur-Orge	June 2012
Rennes	Rennes	BA 271	June 2003
Margny-lès-Compiègne	Compiègne	BA 552	July 2007
Taverny	Cergy	BA 921 Taverny	July 2011
Doullens	Amiens	BA 922 Doullens	July 2006
Roquebrune-Cap-Saint-Martin	Menton	BA 943 Roquebrune-Cap-Martin	September 2012
Châteaudun	Châteaudun	BA 279 Châteaudun	July 2014

Figure 1a shown the location of the affected areas. This graph reveals that base closure (in black in 1a) are concentrated in the North East part of the country, and touch very different territories; some are part of the Paris' suburbs (Taverny, Bretigny), other are regional metropolis (Toulouse, Rennes), and some are located in rural area (Chateaudun).

We select a set of covariates which potentially predict local unemployment. We include in our specification local sectoral composition. This data are collected by INSEE, between 2003 and 2012. We control for disparity in human capital, by introducing data on local graduation rate. This statistics stems from national census (conducted in 2006 and 2012 in France). We also introduce data on employment density. For that purpose, we use annual economic estimation on the number of employment in local employment area, and physical data on surface area expressed in square meters. Finally to better control for local specialization we exploit a partition of economic activity introduced by INSEE. INSEE distinguishes activity belonging to the productive realm and activity belonging to "*the présentielle realm*" which brings together activity meeting local needs (resident and tourist).

Figure 1. Treated area between 2003 and 2014

(a)



5 RESULTS

The findings of our quantitative analysis are two folds. Our first regressions show that air base closure lead to a negative shift in demand for employment, and in an increase in local unemployment. Synthetic control analyses reveal that the impact of base closure is highly heterogeneous depending on where they are located. Finally, our quantitative analysis shows that differential in human capital endowment provide the most relevant explanation for this heterogeneity.

5.1 Interactive Effect Model

In this subsection, we present results from interactive effect models presented in equation 3 and 4. The estimation procedure requires selecting the optimal number of common factors. This is a key point in our empirical analysis because result may be dependent on the number of dimension selected. Indeed, Moon and Weidner (2014) show that under-specification may cause inconsistency, and Bada and Liebl (2014) argue that introducing an oversized number of dimension can lead to inefficient estimation and spurious interpretation due to over-parameterization. To avoid this misspecification we rely on the information criteria of Bai and Ng (2002) to determine the optimal factor dimension. In this application we set the number of factors to seven.

Common factor panel regressions show that air base closure lead to a rise in local unemployment in quarter following air base closure. The negative stimuli for local economy cause a rise in unemployment three quarter after the departure of soldiers. This result is in line with regressions carried out on annual data (not shown here). This negative impact seems robust across specification (cf. equation 1 and 2 in table). Negative impact disappears on average eleven quarter after the departure of soldier. This analysis suggests that negative shock due to air base closure is on average transitory. In the next subsection, we investigate in more detail the heterogeneous resilience displayed by the territories.

5.2 Synthetic Control

This subsection presents synthetic control based on the four specifications presented in section 3.2. The black line in graph displayed in figures 2, 3, 4 and 5 compare the evolution of unemployment in treated regions and in the synthetic control. On the left-hide side of each graph we can appreciate the goodness of the fit of synthetic control. The gap between the black line and the horizontal dotted line reflects gap between observed unemployment in the treated regions prior to the intervention and synthetic regions. As clearly shown by graphs displayed synthetic control seems mimics the treated region (for instance Toulouse) for some areas and not for other (Metz). We focus our attention here on regions with good synthetic control.

Some area seems not significantly impacted by air base closure (Taverny, Toulouse), other seems to recover quickly after the negative shocks (Toul). Finally, other seems to diverge from their prior long-term unemployment path (Reims, Roquebrune or Bretigny). As argued by Kaul et al. (2015) Synthetic Control may be very dependent on the chosen specification. To test the robustness of our estimation we display in figure 6 synthetic control for all specifications. MSPE is minimized when we include the entire pre-treatment path of the unemployment as economic predictors (blue line). This figure also shows that synthetic control method is robust to changes in specification in most cases, but for some regions conclusion seems very linked with the specification of the penalty function (as Toul or

Cambrai).

Are these estimates statistically significant? In other words, does the observed difference between the black line and the horizontal dotted line is a result of hazard, or does it reflect a true economic phenomenon? A method to measure significance in synthetic control is becoming increasingly popular. It consists of running placebo studies on untreated area. For each base closure and each specification we run the synthetic control method to all area not treated. We then display the pathways computed with a grey line (cf. figures 2, 3, 4 and 5) . In practice we only represent estimation with feet close to the treated area (we do not show here area with a MSPE five times higher than the treated area). In some city like Reims, Bretigny, Roquebrune or Margny the estimated effect seems larger with respect to estimated effect for no treated area. In contrast, for other regions like Toulouse, Toul or Taverny the estimated effect for treated area is not statistically different from zero.

Quantitative case studies using synthetic control method shows that territories display very heterogeneous path. In next subsection we will try to understand which factor influence resilience of territories.

5.3 Local characteristics and Resilience

As showed in previous subsection territories displayed very different reaction pattern. Existing theory in New Economic Geography argues that denser area may be better dotted to react after a downward shift. Large labor markets may provide insurance against idiosyncratic shocks by reducing the likelihood that a worker remains unemployed for a long periods when firms are hit by negative idiosyncratic shocks Krugman (1991). Evidence from microeconomic analysis like Combes et al. (2015), and quantitative forecasting model (Capello et al. (2015)) show that large cities provide greater resilience to regions hosting them. Equation (2) in the table 2 shows that on average denser region (measured as the number of employee per square meters) did not perform better in terms of unemployment between 2003 and 2015. In equation (3) we introduce 20 cross terms between our dichotomous variable indicating a shock and employment density (measured one period before the shock begin). These cross terms (not showed here) are not statistically different from zero. By comparing estimation (2) and (3) we see that the introduction of cross terms does not reduce the impact of the downturn. This quantitative analysis shows that differences in density seem not to be at the source of the heterogeneity.

Regional scientist argue that differences in education is aimed at explaining divergence in observed pattern of growth between city Glaeser et al. (2014). In equation (4) we introduce 20 cross term between or dichotomous variable indicating a shock and proportion of graduate (measured one period before the shock begin). When we include in equation (4) these cross terms we show that the negative impact of the downturn disappear (cross terms not showed here are also not significant). This loss of significance of shocks dummys when introducing cross terms, reveals the role played by human capital in bad times. This result are in line with Glaeser et al. (2014) findings, and we observe that better endowed areas in terms of human capital rebound quickly after a shift in local demand of employment.

6 CONCLUSION

This paper exploit a shift in the local demand for works to estimates how effects of local labor demand shocks vary with local labor market. Air base force closure occurring between 2003 and 2014 in France represent a negative downturn for local economy. Air base closure provide a good empirical design because they are spatially concentrated. In addition reduced link between military base and local productive sphere allow the identification of symmetric shock between area. We use a common factor panel (Bai, 2009) and Synthetic Control (Abadie et al., 2010) methods to control accurately endogeneity due to unobserved confounder and spatial correlation.

Common factors panel shows that air base closure lead to a rise in local unemployment in quarter following closure. On average territories absorb this negative shift, and 11 quarter after the choc, local economy recover their pre-choc pattern of employment. However, synthetic control methods reveal heterogeneity in local economy's resilience. Some area seems not significantly impacted by air base closure, other seems to recover quickly after the negative shocks. Finally, other seems to diverge from their prior long-term unemployment path.

In line with existing theory on regional studies, our analysis shows that disparity in human capital endowment is the most relevant explanation for the observed heterogneity in resilience. We observe that better endowed areas in terms of human capital rebound quickly after a shift in local demand of employment. This finding has important political implications because it shows that place based policy implemented after negative downturn should be differentiated between areas.

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Table 2. Interactive Effect Model

	(1)	(2)	(3)	(4)
	Interactive FE	Interactive FE	Interactive FE	Interactive FE
Quarter 1	0.0249	0.026	0.0247	-0.0995
	(0.057)	(0.057)	(0.073)	(0.202)
Quarter 2	0.0876	0.0889	0.142*	0.139
	(0.0614	(0.0614)	(0.0786)	(0.213)
Quarter 3	0.13**	0.133*	0.126	-0.232
	(0.0674)	(0.0675)	(0.0868)	(0.234)
Quarter 4	0.2***	0.211***	0.245*	0.00623
	(0.0756)	(0.0759)	(0.0996)	(0.291)
Quarter 5	0.208***	0.216***	0.244**	0.0947
	(0.0809)	(0.081)	(0.107)	(0.331)
Quarter 6	0.208**	0.216**	0.259**	0.226
	(0.0878)	(0.0878)	(0.116)	(0.356)
Quarter 7	0.199**	0.206**	0.405***	0.743**
	(0.0933)	(0.0933)	(0.123)	(0.368)
Quarter 8	0.26****	0.27***	0.43***	0.635
	(0.0982)	(0.0982)	(0.131)	(0.397)
Quarter 9	0.265***	0.276***	0.349***	0.38
	(0.101)	(0.101)	(0.135)	(0.411)
Quarter 10	0.264**	0.278***	0.314**	0.362
	(0.106)	(0.106)	(0.144)	(0.441)
Quarter 11	0.156	0.167	0.134	0.0923
	(0.109)	(0.108)	(0.147)	(0.455)
Quarter 12	0.0658	0.0774	-0.0219	-0.161
	(0.11)	(0.11)	(0.15)	(0.456)
Quarter 13	-0.0728	-0.0695	-0.246	-0.353
	(0.114)	(0.114)	(0.165)	(0.541)
Quarter 14	-0.0831	-0.0766	-0.328**	-0.7
	(0.112)	(0.111)	(0.164)	(0.525)
Quarter 15	0.00218	0.00676	-0.227	-0.496
	(0.109)	(0.109)	(0.161)	(0.511)
Quarter 16	-0.0729	-0.0698	-0.0434	-0.197
	(0.106)	(0.106)	(0.307)	(0.505)
Quarter 17	-0.117	-0.112	-0.284	-0.403
	(0.1)	(0.1)	(0.35)	(0.483)
Quarter 18	-0.184*	-0.18*	-0.651	-0.385
	(0.0947)	(0.0946)	(0.347)	(0.456)
Quarter 19	-0.238***	-0.237***	-0.521	-0.472
	(0.088)	(0.0881)	(0.341)	(0.44)
Quarter 20	-0.128	-0.127	-0.0234	-0.0493
	(0.0859)	(0.0859)	(0.384)	(0.441)
Industry		-3.45***	-3.56***	-3.44***
		(0.608)	(0.608)	(0.607)
Construction		4.96***	4.73***	4.9***
		(1.51)	(1.51)	(1.51)
Mercantile Tertiary Sector		-2.51	-2.61	-2.46
		(1.75)	(1.75)	(1.75
Non Mercantile Tertiary Sector		-0.282	-0.375	-0.287
		(0.464)	(0.464)	(0.464
Self-Employed		-1.13	-0.461	-1.09
		(1.35)	(1.36)	(1.35)
Ungradued		2.63*	1.87	2.62
		(1.59)	(1.6)	(1.59)
Professional Degree		-5.03****	-5.71***	-5.04***
		(1.64)	(1.65)	(1.64)
Universitary Degree		-5.16***	-5.46***	-5.15***
		(1.81)	(1.82)	(1.81)
Employment Density		-0.00903	-0.00995	-0.00904
		(0.0372)	(0.0378)	(0.0374)
Constant	8.6	12***	12.5***	12***
	(0.886)	(0.919)	(0.936)	(0.92)
Cross Term			Density $\times Quarterly_i$	Universitary Degree $\times Quarterly_i$
Additive Effect	None	None	None	None
Observation	304	304	304	304

Figure 2. Predictors: Entire Pre-Treatment Path

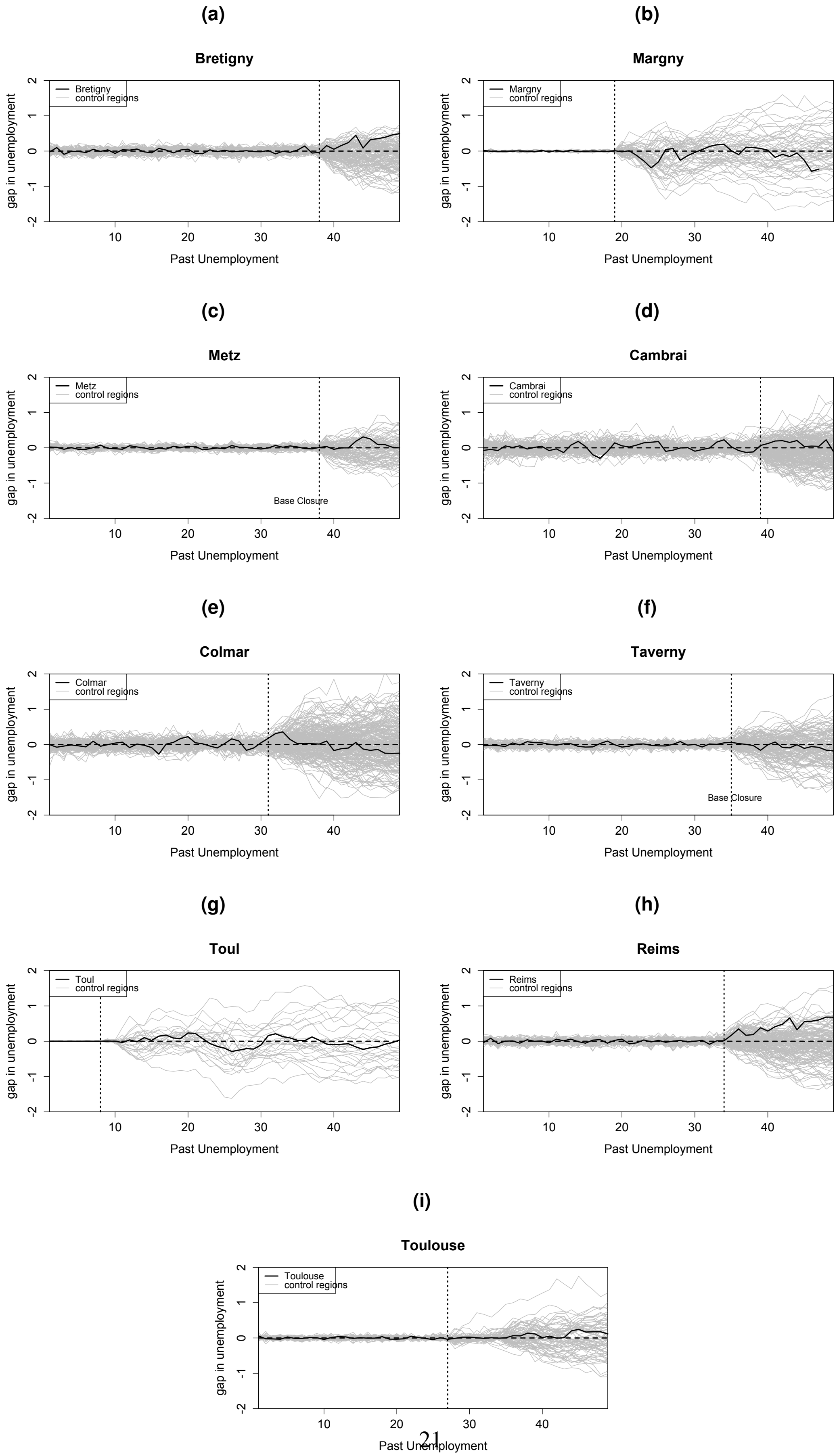

Figure 3. Predictors: Entire Pre-Treatment Path and Covariates

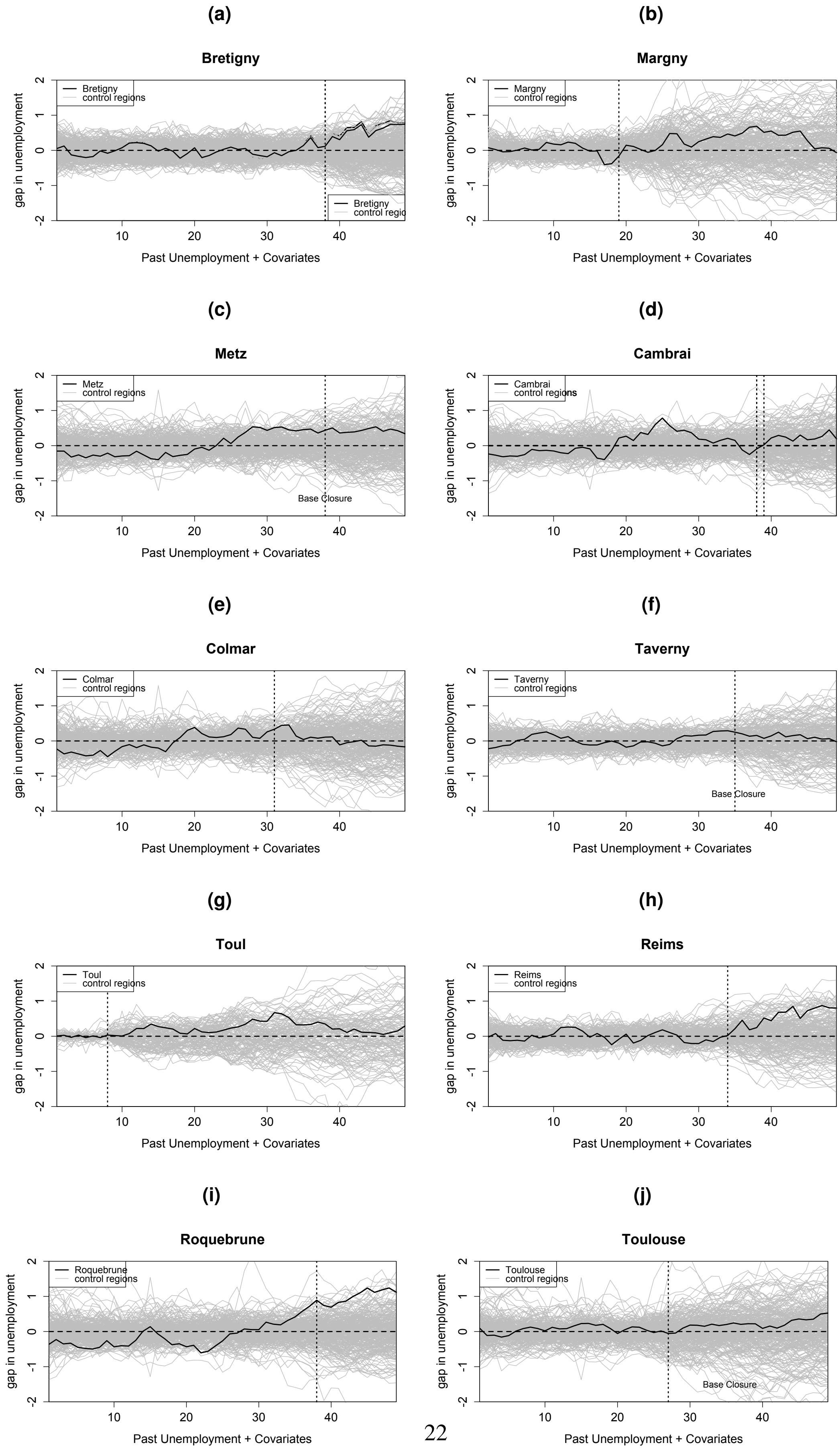

Figure 4. Predictors: Only Covariates

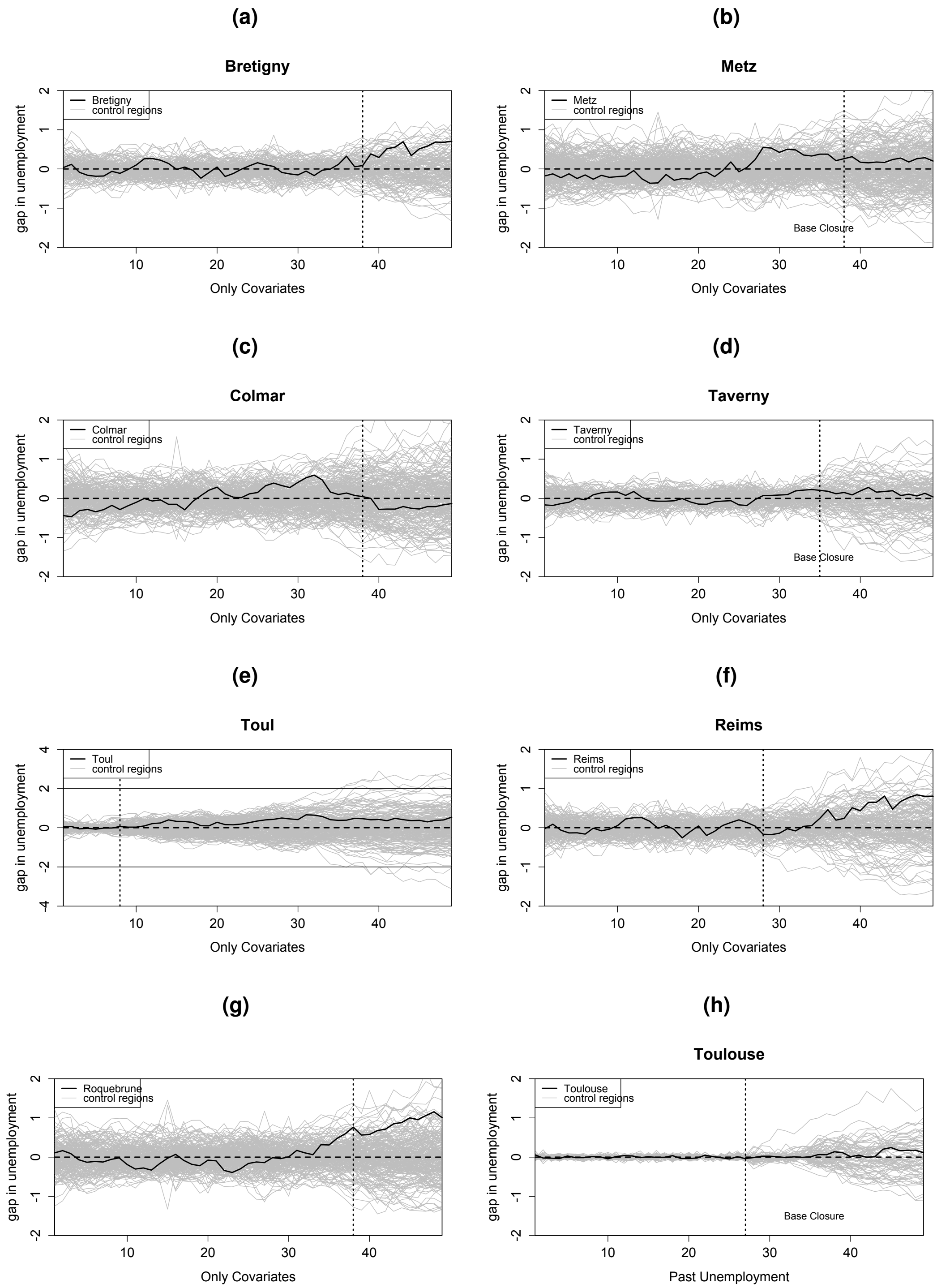

Figure 5. Predictors: Covariates and Last Pre-Treatment Unemployment

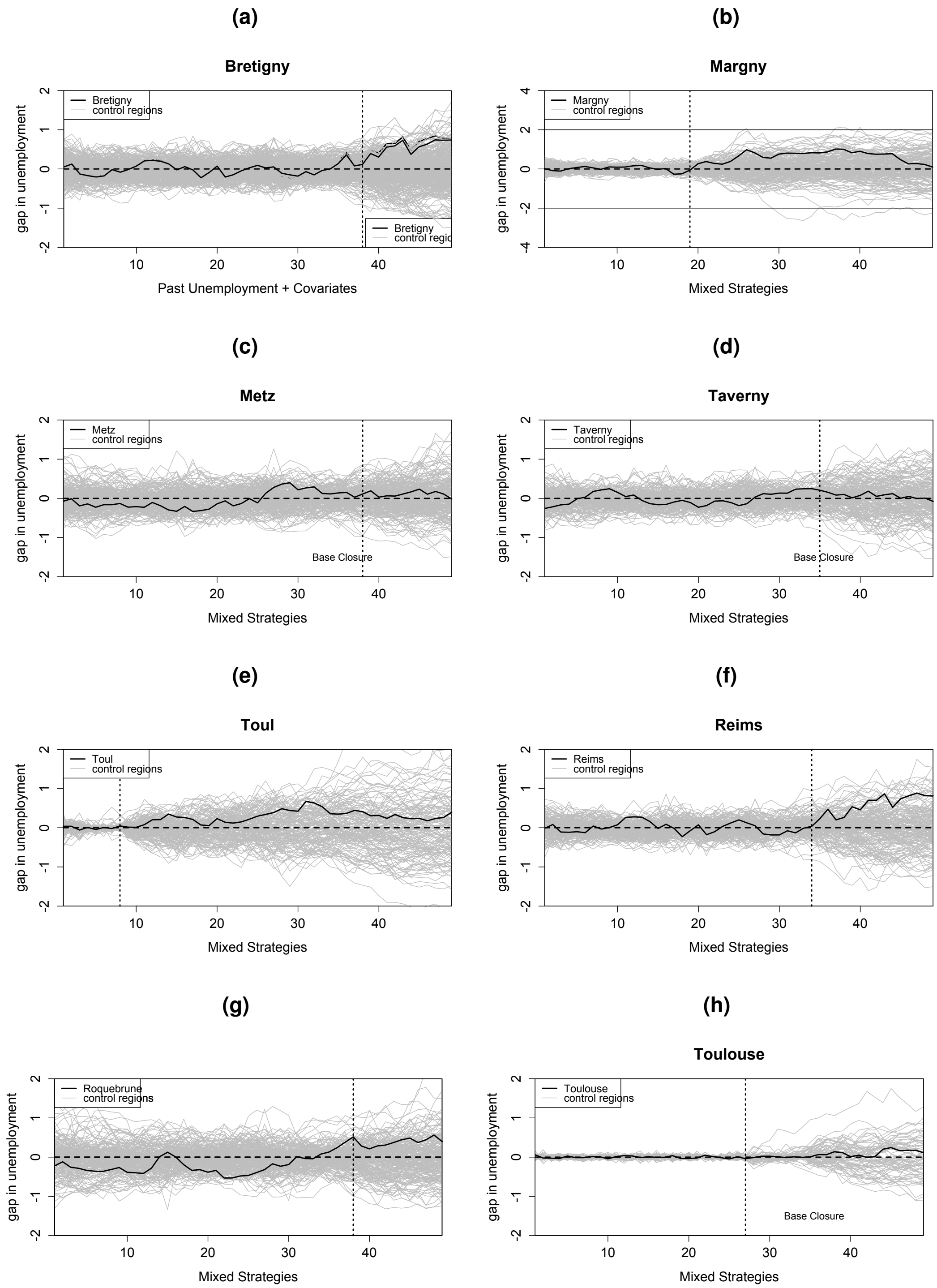

Figure 6. Robustness Check