Economic Freedom and Growth Across German Districts*

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Abstract

In this paper, we revisit the relationship between economic freedom and growth using the sub-national variation in fiscal and economic institutions across 407 German districts (Kreise) for the period 2000-2010. To this end, we build ten indicators of economic freedom for each district and classify them into three latent categories: (i) taxes and government spending, (ii) business regulation, and (iii) size of the public sector. Exploiting the variation in the constructed indices of economic freedom, the evidence suggests less indebted districts with less stringent business regulation, lower share of taxes and relatively smaller public sectors achieve consistently higher productivity growth. The beneficial effect of economic freedom on growth is robust to the variety to exclusion restrictions and to numerous specification checks. The evidence unveils persistent distributional effects of economic freedom on growth and highlights a U-shaped pattern. Economic freedom is most beneficial for growth in the districts with the lowest per capita income, the effects fades away at the median of district-level income distribution, and tends to increase above the median. The evidence does not advocate lower level of economic freedom in former East German districts or greater economic freedom in West German districts. However, the evidence unveils a persistent North-South institutional gap which possibly accounts for per capita income gaps within Germany.

JEL Codes: C21, O43
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1. Introduction

The notion that greater economic freedom fuels economic growth has received significant scholarly attention. The cornerstones of economic freedom are secure property rights, freedom to engage in voluntary transactions, access to sound money, freedom to compete, and personal choice. The empirical evidence offers ample support to the notion that countries with more open markets, secure property rights and limited government under a genuine rule of law tend to achieve consistently higher rates of economic growth in comparison with countries with a lower degree of economic freedom. Countries with the institutional environment that supports economic freedom tend to achieve higher growth (Easton and Walker 1997, Heckelman 2000, Scully 1988, Berggren 2003, Cole 2003, Dawson 1998, 2003, Bengoa and Sanchez-Robles 2003, Vega-Gordillo and Álvarez-Arce 2003, Gwartney et. al. 1999, 2004, 2006), Doucouliagos and Ulubasoglu 2006, Azman Saini et. al. 2010), lower unemployment (Grubel 1998), higher life expectancy (Esposto and Zaleski 1999), lower mortality (Grubel 1998), more equal income distribution (Scully 2002), lower poverty rates (Connors and Gwartney 2010), better quality of health care and education (Stroup 2007), lower pollution (Norton 1998), and are more prosperous in the long run (Torstensson 1994, Hanke and Walters 1997, De Haan and Siermann 1998, Ken Farr et. al. 1998, Sturm and De Haan 2001, Dawson 2003, Faria and Montesinos 2009) The vast majority of the studies on the nexus between economic freedom and growth is based on cross-country comparisons. The general weakness of cross-country studies lies in the comparison of different types of institutional framework (Spamann 2009, Klick 2010, Helland 2016). Particular changes in public policies of legal rules that might favor or hamper economic freedom can be hardly comparable across countries with different sets of economic, legal and political institutions that disallow such a comparison. Since many factors related to the economic freedom can change beyond the legal rules and policy changes, a cross-country investigation of the effects of economic freedom on growth rates and income levels might be subject to several identification frailties. The fundamental problem is the one of statistical identification (Helland and Klick 2011). Even though the new institutional economics literature has identified a number of correlations between a variety of economic outcomes and economic freedom, the presence of omitted variable bias in cross-country investigation renders policy conclusions on which policies or institutions to adopt problematic. Investigating the effects of economic freedom on growth rates and income levels under common institutional environment could partially, albeit imperfectly, address the omitted variable bias inherent in cross-country comparisons of various economic outcomes and economic freedom (Gwartney and Lawson 2003, Heckelman and Stroup 2005).

In this paper, we re-examine the relationship between economic freedom, growth rates and income levels in a sample of 407 German districts in the period 1995-2010. To this end, we deploy principal component analytical framework and construct a synthetic index of economic freedom which comprises de facto regulatory differences across districts, property and turnover taxation, public debt, size of the public sector, public debt and the size of the shadow economy. Our investigation unravels marked disparities in the level of economic freedom across German districts. The districts in the south German states (Bavaria and Baden Württemberg) tend to have consistently higher level of economic freedom characterized by lower rates of property and business turnover taxation, smaller public sectors, higher rates of start-up formation and smaller size of the public sector. Contrary to widespread beliefs, our evidence reveals that the former east German districts do not have lower levels of economic freedom than their West German counterparts, and tend to have higher level of economic freedom than the national average. On the contrary, former east German district appear to have slightly but persistently higher levels of economic freedom than their west German neighbors excluding the districts in Bavaria and Baden-Württemberg. Our investigation reveals persistent

north-south institutional gap in the distribution of economic freedom rather than the west-east gap which traditionally features a widespread scholarly acclaim. Specifically, our empirical strategy exploits the variation in the level of economic freedom as a source of differences in district-level growth rates and income levels. The results show that greater economic freedom contributes significantly to income levels and growth rates although the short-run effects on growth are much less predictable than long-run effects on income levels, yet still statistically significant at conventional levels. Furthermore, we employ quantile regression approach

Several papers are related to ours. First, Potrafke (2013) proposed two distinctiv3e indices of economic freedom for German states (Länder) incorporating the components of economic freedom advocated by Fuest et. al. (2009), namely, (i) the size of government, (ii) direct taxation levels, and (iii) mandatory social insurance and welfare contributions. His approach exploits the variation in government ideology as a source of cross-Länder differences in economic freedom. His findings suggest that in the former West German states, right-wing governments under the flagship of Christian Democratic Union (CDU) propagated economic freedom compared to the center-left government of Social Democatic Party (SDP) whereas no such pattern can be found in former East German states. Our approach does not investigate the origins of economic freedom but attempts to answer whether differences in economic freedom explain growth rates and income levels across German districts. District-level variation in economic freedom can potentially improve the understanding of the consequences of the institutional variation at the local level for economic outcomes such as growth rates and income levels. Second, Bjornskøv and Foss (2008) examine the contribution of economic freedom to entrepreneurship, and show that government size correlates negatively with entrepreneurial activity, sound money tends to boost entrepreneurship while other measures of economic freedom are not significantly correlated with entrepreneurship. Third, Karabegovic et. al. (2003) construct a composite measure of economic freedom consisting of nine different measures in the areas government size, taxation and labor market regulation originally proposed by Gwartney et. al. (1996, 2002) and discussed in-depth by Carlsson and Lundström (2002). Their results advocate the beneficial effects of greater economic freedom on both the level and growth of economic activity. And fourth, Bologna et. al. (2016) examine the spatial relationship between institutional quality and economic outcomes across 381 U.S metropolitan areas using Stansel (2013) index of economic freedom for MSAs, and specially allow for direct and indirect effects of economic freedom on growth and income levels. Their findings suggests that greater economic freedom improves growth and income levels of U.S metropolitan areas, and that combined direct and indirect effects are quantitatively larger than the direct effects alone, suggesting a strong spillover effect of economic freedom from the neighboring areas.

Compared to the existing approaches, we tackle and revisit the relationship between economic freedom and growth in a sub-national sample of German district which comprises local rather than state-level or provincial variation in the institutional quality as a source of differences in economic performance. Although greater economic freedom is associated with markedly higher levels and growth rates of economic activity sub-nationally, the existing evidence in our view is still inconclusive to reach a definite consensus on whether expanding economic freedom tends to improve the economic performance even under common institutional environment. The contrasting historical experience between former east and west German districts in the period 1945-1990 offers ample opportunities for investigating the effects of economic freedom on economic activity where in 1945 west German districts established free-enterprise institutional environment while the former east German district leaned towards socialist economic principles. The rest of the paper is organized as follows. Section 2 outlines the institutional background of German districts focusing on the role of economic freedom in local institutional variation, and presents a new synthetic index of economic freedom for

German districts. Section 3 discusses the empirical strategy. Section 4 presents the results and robustness checks. Section 5 concludes.

2. Institutional Background and an Index of Economic Freedom for German Districts

In Germany, the Federal Constitution (Grundgesetz für die Bundesrepublik Deutschland) sets out the administrative division divided into (i) states (Länder) and city states (Kreisfreie Städte), (ii) government regions (Regierungsbezirke), (iii) districts (Kreise), and (iv) municipalities (Gemeinden). The districts correspond to NUTS 3 level of EU administrative divisions are roughly equivalent to counties in the United States. The districts are roughly divided into rural (Landkreise), urban (Stadtkresie) and special-type districts prevalent in the federal states Saarbrücken, and some parts of Niedersachsen and Nordrhein Westphalen. The latter type of districts is a fusion of district-free city states with its adjacent rural districts. The district council (Kreistag) is the highest institution of a rural district and is responsible for all fundamental guidelines of regional self-administration. The council is elected every five years, except in Bavaria where it is elected every six years. The highest administrative position of a distriction is held by an officer (Landrat or Landrätin) who is responsible for the district's administrative and acts as its representative for all official purposes. In urban districts, a similar function is performed by a mayor. In some states, rural districts have an additional commission (Kreisausschuss) led by the officer which takes over certain administrative functions which vary from state to state. The federal and state law delegate an extensive set of fiscal responsibilities to the districts such as (i) taxation of business turnover, (ii) collection of income and property taxes, and (iii) financing of social welfare, health and education programs. Depending on state law, districts can perform additional functions related to the financial support for culture, education, and encouraging of tourism.

2.1 A Synthetic Index of Economic Freedom

We construct a synthetic index of economic freedom by exploiting the variation in levels of taxation, regulatory environment, and size of government across German districts. Our index of district-level economic freedom consists of eight different components in the three areas: (i) business start-up formation rate, (ii) share of property taxes in district GDP (in %), (iii) share of business turnover tax in district GDP (in %), (iv) share of municipal income taxes in district GDP (in %), (v) share of municipal VAT tax in district GDP (in %), (vi) share of public debt in district GDP (in %), (vii) share of public employment in total employment (in %), and (viii) the share of shadow economy in district GDP (in %). The index is constructed for the period 1995-2010. Due to a variety of state-level administrative border reforms, we refrain from a longitudinal measures that allows the intertemporal comparison for a limited sample of districts and construct a cross-sectional measure allowing for the comparison of economic freedom across a full sample of districts.

Business start-up formation rate captures all newly formed enterprises in a given district in every year and is constructed from the statistical business register. The property tax, turnover tax, income tax and VAT and public debt variables are constructed by taking the gross amount of collected tax and debt, and dividing it by the district GDP. The share of public employment is constructed by dividing the number of public sector employees with total employment for each district. The variables are constructed from *GENESIS Regionaldatenbank Deutschland*. The data on the size of the district-level shadow economy relative to GDP is from Bühn (2011).

Let $\mathbf{Z} = \{Z_{1i}, Z_{2i}, ...Z_{ki}\}$ denote a vector of original components of economic freedom where $k = 1, 2, ...K$ represents the total number of components and $i = 1, 2, ...N$ denotes the

sample size. For each original component, we adjust the potentially excessive variation in the component across districts through a simple unconstrained linear scaling transformation of the following form:

$$\mathbb{N}(Z_k) = \frac{Z_{1k} - \min\{Z_{k1}, Z_{k2}, \ldots Z_{kn}\}}{\max\{Z_{k1}, Z_{k2}, \ldots Z_{kn}\} - \min\{Z_{k1}, Z_{k2}, \ldots Z_{kn}\}} \tag{2.1}$$

Where $\mathbb{N}(Z_k)$ is a normalized measure of district-level economic freedom ranging from 0 to 1 where lower values correspond to lower level of economic freedom, Z_{1k} is the original component drawn from the overall component pool $\{Z_{k1}, Z_{k2}, \ldots Z_{kn}\}$ indexed by $k = 1, 2, \ldots K$. Linear scaling transformation approach to measuring economic freedom has been pioneered by Gwartney et. al. (1996, 2001, 2002) and conveys several advantages such as a direct comparison of district-level differences in the component of economic freedom on a similar level reflecting relative differences. It also mitigate the concerns arising from the excessive sampling variation in the distribution of each component that may result in the outlier observations which can render the use of the constructed economic freedom index fundamentally unsuitable in establishing the effects on various dimensions of economic performance.

The traditional approach towards constructing a composite measure of economic freedom is the construct a simple unweighted average of all component from $k = 1, 2, \ldots K$ baseline component pool. However, such an approach might not reflect the full variation in the level of economic freedom across $i = 1, 2, \ldots N$ districts. The key issue arises from the neglect of the maximum overall variation inherent in a simple averaging of linearly normalized components. We identify the level of economic freedom across districts using the principal component analysis (PCA). Specifically, we compute the variance-covariance matrix for maximum possible combinations of the original components and compute the value of the eigenvectors from the set of weights derived from variance-covariance matrix:

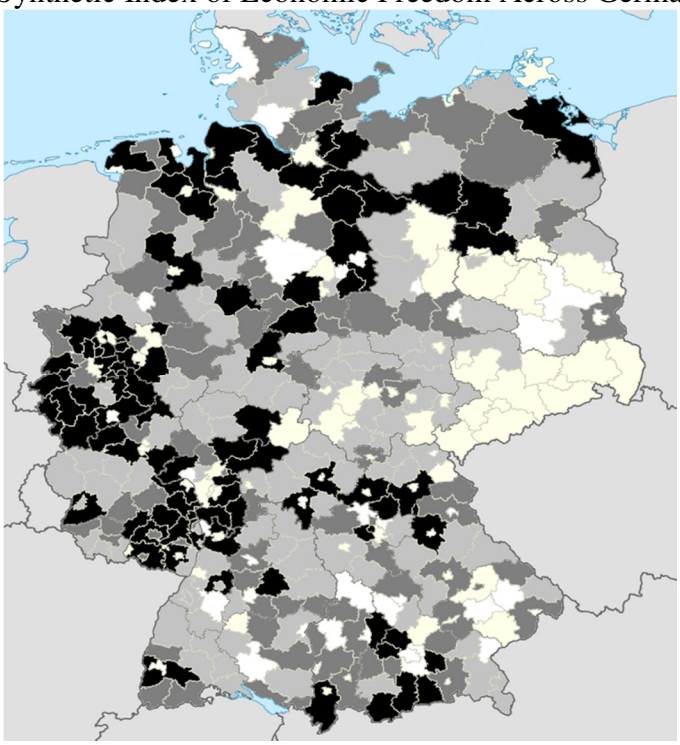
$$\mathbf{Z}_i^{Synthetic} = w_1 Z_1 + w_2 Z_2 + \ldots + w_j Z_k = \sum_{j=1}^{J} \sum_{k=1}^{K} w_j Z_k \tag{2.2}$$

where $\mathbf{w} = \{w_1, w_2, \ldots w_j\}$ is the vector of optimal weights comprising the latent index of economic freedom selected from the variance-covariance matrix rotation in PCA. The eigenvectors with eigenvalues below unity are excluded from the candidate weights used to construct a synthetic index of economic freedom to ensure that the most powerful eigenvector is selected reflecting the maximum variation in the level of economic freedom across districts. The highest eigenvector has an absolute value slightly above 2 and Cronbach (1951) alpha coefficient in the acceptable range ($\alpha = 0.54$) indicating an internally consistent synthetic measure of economic freedom.

In Figure 1, a spatial distribution of the synthetic index of economic freedom is presented for the full sample of 407 districts. The values of the index are delimited by color into four quartiles: low (black), lower intermediate (dark grey), upper intermediate (light grey) and high (white). The evidence suggests that the distribution of economic freedom through our synthetic index is uneven. Low levels of economic freedom are clustered in northwestern and western German states Niedersachsen, Nordrhein Westfallen, Rheinland Palatinate, and Saarbrücken. In West German subsample, districts in Bavaria and Baden Württemberg tend to have markedly higher levels of economic freedom than other west German districts. Across the board, districts in west German states have significantly lower levels of economic freedom than

their eastern counterparts. The p-value on a simple mean difference between western and eastern districts' level of economic freedom equals p = 0.000 and indicates a marked disparity in the level of economic freedom across east-west subsamples. In addition, south German districts do not seem to have higher level of economic freedom than former eastern districts (p-value = 0.365) although they seem to have markedly higher level of economic freedom than other west German districts. A simple comparison of economic freedom differences across different geographical parts of Germany advocates a markedly lower levels of economic freedom in north German districts compared to the rest of the country which holds either with or without east German district included in the full sample (p-value = 0.036). The comparison of the synthetic index across districts advocated two important patterns. First, if the synthetic index of economic freedom is a sufficient proxy for the quality of economic institutions, the east-west gap has not only disappeared but has been reversed in favor of the former eastern districts. And second, the east-west gap has been subsided by the north/west-south/east gap. In particular, the north/west axis comprises the districts in northern and western German states (Niedersachsen, Nordrhein Westfallen, Rheinland Palatinate, Saarbrücken) while the south/east gap comprises former east German states (Brandenburg, Sachsen, Sachsen Anhalt, Mecklenburg-Vorpommern, Thüringen) and south German states (Bavaria, Baden Württemberg). The latter cluster tends to have substantially higher levels of economic freedom than the north/west cluster (p-value = 0.000) which suggests that the gap between the two gradients does not seem to be an artefact. In Appendix A1, the districts are ranked by the synthetic index of economic freedom.

Figure 1: Synthetic Index of Economic Freedom Across German Districts



3. Empirical Strategy

The goal of our empirical strategy is to examine the contribution of economic freedom to the growth rates and income levels across the full district sample. Our empirical strategy sets to distinguish between the short-run effect of economic freedom (on growth rates) and its long-

run effect (on income levels). For a full cross section of districts, we estimate the following two sets of the core model specification:

$$\ln y_{i,j,k,l} = \ln A + \hat{\gamma}_1 \cdot EF_{i,j,k,l} + \mathbf{X}'\beta + \sum_{j=1}^{J} \hat{\phi}_j \cdot 1[i \in j] + \sum_{k=1}^{K} \hat{\alpha}_k \cdot 1[i \in j \in k] + \sum_{l=1}^{L} \hat{\Theta}_l \cdot 1[i \in j \in k \in l] + \varepsilon_{i,j,k,l} \quad (3.1)$$

$$\Delta \ln y_{i,j,k,l} = \ln A + \hat{\lambda}_1 \cdot EF_{i,j,k,l} + \mathbf{X}'\alpha + \sum_{j=1}^{J} \mu_j \cdot 1[i \in j] + \sum_{k=1}^{K} \theta_k \cdot 1[i \in j \in k] + \sum_{l=1}^{L} \Gamma_l \cdot 1[i \in j \in k \in l] + u_{i,j,k,l} \quad (3.2)$$

where y is the per capita income level and $\Delta \ln y$ is the average growth rate of for i-th district indexed by $i = 1, 2, ...N$, and $\mathbf{X}$ is the vector of structural control variables. The key covariate of interest is EF which denotes the synthetic index of economic freedom. The headline coefficients of interest are $\hat{\lambda}_1$ which captures the short-run effect of economic freedom on growth rate, and $\hat{\gamma}_1$ which captures the long-run effect of economic freedom on cross-district income levels. Both short-run and long-run empirical specification of the cross-district growth model contain the set of unobserved effects confounding the relationship between economic freedom, growth and income levels. The set of spatial fixed effects is introduced at the administrative regional level, indexed by $j = 1, 2...J$, government regional level (Regierungsbezirke), indexed by $k = 1, 2...K$, and at the state (Länder) level, indexed by $l = 1, 2, ...L$. The set of covariates denoted by $1[\cdot]$ represented the indicator function representing the set of administrative regions, government regions and federal state.The terms ε and u capture the stochastic disturbances.

A valid inference on $\hat{\gamma}_1$ and $\hat{\lambda}_1$ can be underminded by the robust standard errors, clustered on the district unit if the stochastic disturbances are correlated across districts which renders the estimated parameters inconsistent in spite of controlling for the unobserved effects. The failure to control for within-district residual correlation present at multiple levels of aggregation is likely to yield substantially underestimated standard errors which leads to the over-rejection of the null hypothesis, and triggers Moulton bias (Moulton 1986, 1990). The inclusion of multiple sets of fixed effects does not remedy the serially correlated stochastic disturbances beyond the baseline unit level (Davis 2002, Pepper 2002, Bertrand et. al. 2004, Kezdi 2004). We attempt to overcome the multi-way serially correlated disturbances by using a non-nested multiway clustering scheme (Cameron et. al. 2011) to tackle the within-cluster serially correlated stochastic disturbances simultaneously at district-, administrative regional-, government regional-, and state-level. Specifically, we deploy a multiway error component model under i.i.d residual distribution assumption. Compared to the traditional one-way clustering schemes such as robust variance-covariance OLS matrix estimator (Huber 1967, Eicker 1967, White 1980), the non-nested multiway clustering estimator facilitates a valid inference on the key parameters even in the presence of non-zero within-cluster residual correlation at multiple levels of the cross-sectional dataset (White 1984, Pfefferman and Nathan 1981, Liang and Zeger 1986, Arellano 1987, Wooldridge 2002, Cameron and Trivedi 2005, Hansen 2007).

The non-nesed multiway clustering scheme on the underlying empirical distribution function ensures that the key parameters on the short-run and long-run effect of economic freedom are robust against any arbitrary heteroscedasticity and serially correlated residuals at the district-, administrative-, government regional, and state level which might mask the true effect of economic freedom on growth and income levels, respectively.

Standard linear OLS regression approach towards the relationship between economic freedom and income level or growth rates summarize the average effect between the economic growth and growth or income level. The estimated parameter relies on the conditional mean function which implies that the underlying effects holds on average but tends to neglect the relationship at different points in the conditional distribution of income levels or growth rates. We address the potential discrepancy between the average effect and full distributional effect of economic freedom on income and growth disparities by composing a conditional function of the outcome variables across different tails of the empirical distribution. Let $q \in \{0,1\}$ denote a quantile of the empirical distribution function splitting the data into proportions q below and $1-q$ above the conditional quantile function. We construct the quantile-specific estimate of economic freedom on two district-level outcomes by estimating the following set of objective non-differential functions:

$$Q(\gamma_1) = \sum_{i:\ln y \geq \mathbf{X}_i'\beta}^{N} q\left|\ln y_i - \mathbf{X}_i'\beta_q\right| + \sum_{i:\ln y < \mathbf{X}_i'\beta}^{N} (1-q)\left|\ln y_i - \mathbf{X}_i'\beta_q\right| \tag{3.3}$$

$$Q(\lambda_1) = \sum_{i:\Delta\ln y \geq \mathbf{X}_i'\beta}^{N} q\left|\Delta\ln y_i - \mathbf{X}_i'\beta_q\right| + \sum_{i:\Delta\ln y < \mathbf{X}_i'\beta}^{N} (1-q)\left|\Delta\ln y_i - \mathbf{X}_i'\beta_q\right| \tag{3.4}$$

where $Q(\gamma_1)$ and $Q(\lambda_1)$ denote the quantile-specific effect of economic freedom on growth and income levels per $Q(\cdot)$ quantile while $\mathbf{X}_i'\beta_q$ represents the full set of right-hand side variables. For each quantile in the empirical distribution function, the effect of economic freedom on two outcome variables is obtained by substituting the linear models of outcomes for (3.4) and (3.2) for the quantile model allowing for the change in the underlying coefficient at a given proportion of the outcome distribution. The major threat to the valid inference on $Q(\gamma_1)$ and $Q(\lambda_1)$ is posited by the potential intra-cluster correlation of residuals which might yield inconsistent estimates of the quantile-specific effect of economic freedom on growth and income levels, hence, masking the true vs. artificial effect heterogeneity.

We mitigate the concerns related to heteroscedasticity of residual distribution and serially correlated stochastic disturbances and estimate the heterogeneous effect of economic freedom on growth consistently using the robust variance-covariance matrix by Parente and Santos Silva (2016) which allows us to adjust the standard errors for serially correlated stochastic disturbances at various layers of administrative division. Let $g = 1, 2 \ldots G$ denote the number of clusters each with $n_g = n$ elements. We allow λ_1 and γ_1 to differ across tail proportions in the presence of non-zero intra-cluster residual correlation which implies that both parameters are estimated from the following minimization problem:

$$\tilde{\gamma}_1^q = \arg\min_q \frac{1}{G}\sum_{g=1}^{G}\left\{\sum_{\ln y_i > X_{ig}'\beta_q} q\left|\ln y_{gi} - X_{ig}'\beta_q\right| + \sum_{\ln y_i < X_{ig}'\beta_q} (1-q)\left|\ln y_{gi} - X_{ig}'\beta_q\right|\right\} \tag{3.5}$$

$$\tilde{\lambda}_1^q = \arg\min_q \frac{1}{G}\sum_{g=1}^{G}\left\{\sum_{\Delta \ln y_i > X_{ig}^{'}\beta_q} q\left|\Delta \ln y_{gi} - X_{ig}^{'}\beta_q\right| + \sum_{\Delta \ln y_i < X_{ig}^{'}\beta_q} (1-q)\left|\Delta \ln y_{gi} - X_{ig}^{'}\beta_q\right|\right\} \quad (3.6)$$

where $\tilde{\lambda}_1^q$ and $\tilde{\gamma}_1^q$ denote the full distributional effect of economic freedom on growth and income levels estimated using the Parente-Santos Silva robust variance-covariance matrix estimator, and G denotes the number of sample clusters. When the residuals are i.i.d. and in the absence of non-zero intra-cluster correlation the underlying estimators are equivalent to the Koenker and Bassett (1978) quantile regression estimator, and equivalent to the standard heteroscedasticity-robust estimator (Powell 1984, Chamberlain 1994, Kim and White 2003). To allow for asymptotically valid standard errors under heteroscedasticity and model misspecification, we test for the presence of heteroscedasticity and intra-class residual correlation following the standard procedure advocated by Machado and Santos Silva (2000) and Parente and Santos Silva (2016).

4. Data

4.1 Outcomes

Our outcome variables are the income level and the growth rate of per capita income. The income level is constructed as the per capita GDP is denoted in EUR and expressed in 2005 constant prices to control for the effect of the price level shifts over time using a common federal-level GDP deflator. In the full cross section of districts, we use the income level in the year 2011 as the final observation year. The growth rate of per capita GDP is constructed as a simple unweighted average rate of change in per capita income (at constant 2011 prices) in the period 1995-2011. Both outcomes are constructed using the data from *GENESIS Regionaldatenbank*.

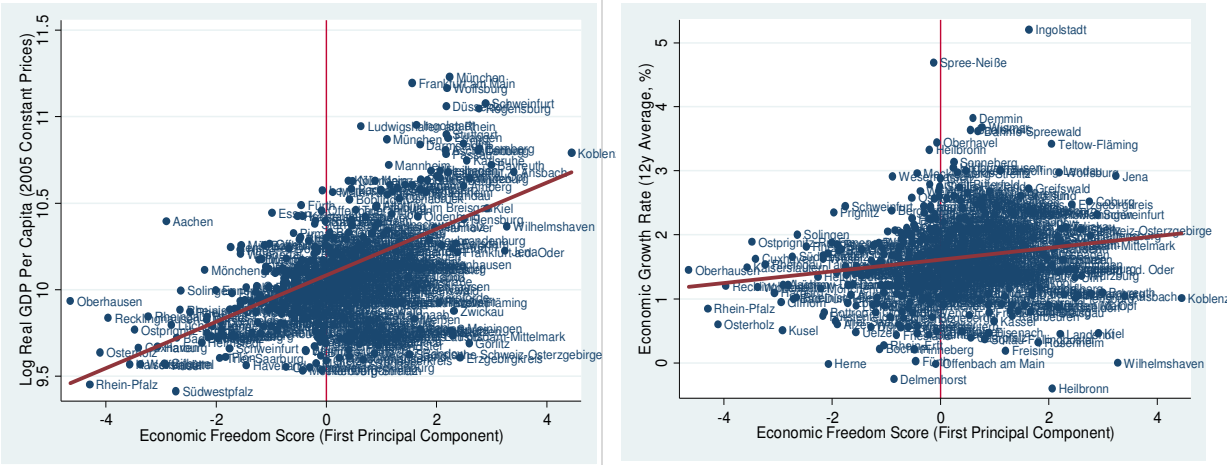
Figure 2 displays the relationship between our synthetic index of economic freedom, growth rate and income levels across districts for the full district-level sample. The vertical line on the horizontal axis delimits the district-level observations into above-average and below-average districts in terms of the level of economic freedom inferred from the synthetic index. Panel (a) indicates a substantial correlation between the income level and the synthetic index of economic freedom. The sample correlation between the log income level and synthetic index of economic freedom is 0.55 (two-sided p-value = 0.000). The aggregate correlation does not disappear when the relationship is assessed in former East and West German subsamples with the unchanged significance level (p-value = 0.000).

In Panel (b), the synthetic index of economic freedom is slightly weakly, yet still significantly associated with cross-district growth differences with the underlying correlation coefficient 0.17 (p-value = 0.000). In contrast, the correlation between economic freedom and growth at district-level appears to be weak among former East German districts (p-value = 0.21) whereas it becomes noticeably stronger and marginally significant in the former West German districts (p-value = 0.12).

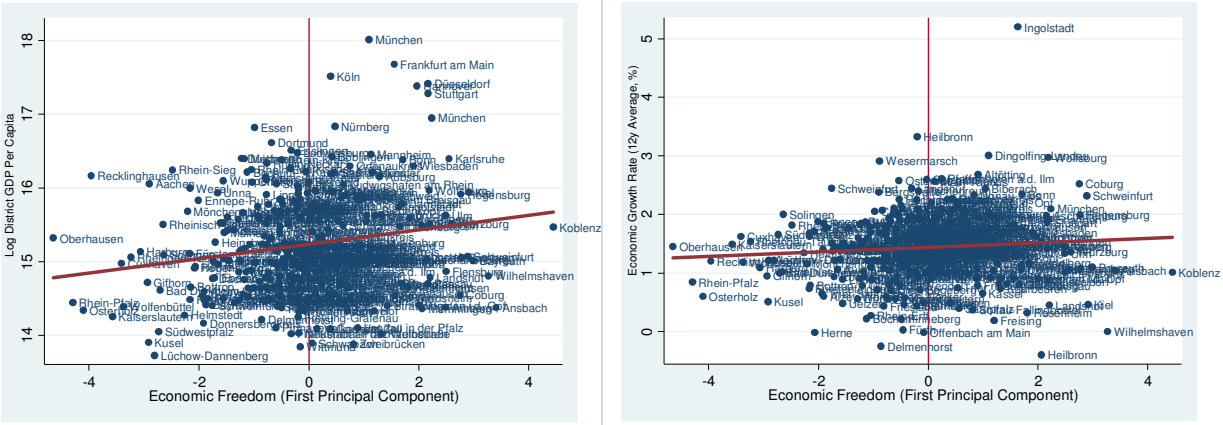
Figure 2: Economic Freedom, Growth and Income Levels Across German Districts

(a) Economic Freedom and Income Levels | (b) Economic Freedom and Growth

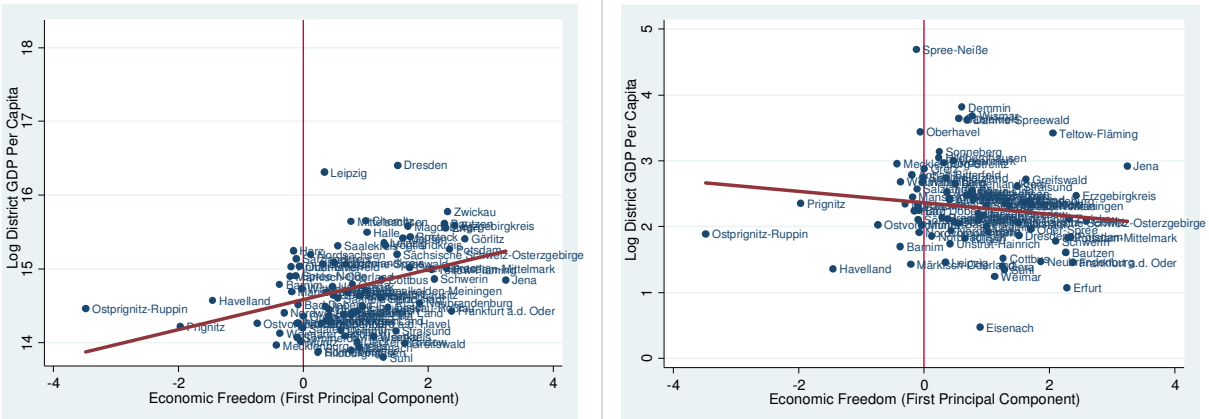
Full Sample



West German Sub-Sample



East German Sub-Sample



4.2 Covariates

The set of control variables consists of the sectoral GDP shares broken down into the share of agriculture, the share of industrial manufacturing, the share of craftsmanship, the share of construction, the share of trade, the share of financial services, and the share of public services in the total district-level output. We specifically distinguish between the industrial manufacturing and the craftsmanship. The former encompasses large-scale industrial activity while the latter comprises the output generated by professionally qualified and state-approved

crafts. Trade activities comprise trade, transport services, information and hospitality services and communication services. Financial services encompass financial intermediation services, insurance, business services, real estate and housing services. Public services comprises all state-provided services in the public administration, education and health care services.

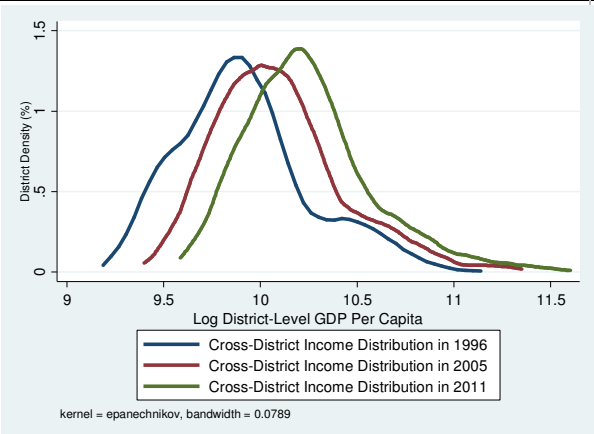
In Figure 3, the intertemporal distribution of log per capita GDP and growth rates is presented for the full district-level sample, and broken down into three benchmark years. Panel (a) presents the distribution of per capita GDP for three years. The evidence suggests that the distribution of per capita GDP gradually evolved toward greater evenness with the disappearance of the twin peak from 1996 onwards alongside a shift of the mean level to the right. Much less diversity is indicated in the distribution of growth rates presented in Panel (b) where the non-parametric evidence highlights a strong similarity in the rates of growth between 1996 and 2005, as well as a notable shift of mean growth rate to the right in 2011. In Table 1, the full descriptive statistics of the outcomes and covariates is presented in greater detail.

Table 1: Descriptive Statistics

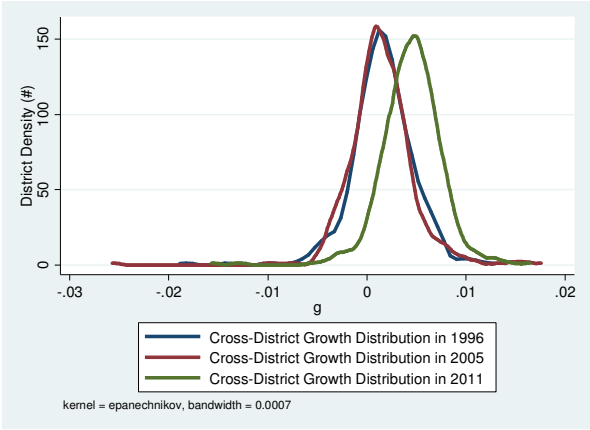
	Obs	Mean	StD	P25	P50	P75	Min	Max
Panel A: Economic Outcomes								
Real GDP Per Capita (EUR, 2005 Constant Prices)	411	25,476	9,887	18,972	22,927	28,181	12,247	75,403
Economic Growth Rate (%)	411	1.60	0.71	1.18	1.55	2.01	-0.40	5.20
Panel B: Indicators of Economic Freedom								
Start-Up Formation Rate (%)	411	-1.08	1.81	-1.69	-0.83	-0.06	-9.71	6.94
Property Tax (% District GDP)	411	0.47	0.13	0.39	0.45	0.62	0.10	1.05
Turnover Tax (% District GDP)	411	1.39	0.48	1.09	1.32	1.64	0.22	4.45
Municipal Share of Income Tax (% District GDP)	411	1.17	0.45	0.83	1.13	1.43	0.12	2.92
Municipal Share of Value-Added Tax (% District GDP)	411	0.14	0.03	0.12	0.14	0.16	0.03	0.31
Public Debt (% District GDP)	407	6.62	4.83	3.25	5.39	8.79	0.00	38.15
Public Sector Employment-to-Population Ratio	407	4.11	2.27	2.68	3.33	4.84	1.22	19.17
Shadow Economy (% District GDP)	385	14.66	0.91	14.00	14.60	15.30	12.40	17.20
Panel C: Sectoral Covariates								
Agriculture, Forestry and Fishing (% District GDP)	411	1.56	1.37	0.35	1.26	3.49	0.03	6.72
Industrial Manufacturing (% District GDP)	411	22.99	9.03	17.17	22.18	28.11	4.94	65.23
Craftsmanship (% District GDP)	411	20.69	9.19	14.68	19.74	32.67	2.28	63.34
Construction (% District GDP)	411	5.33	2.19	3.74	4.98	8.24	1.08	14.68
Trade, Transport and Communication (% District GDP)	411	15.35	3.70	12.86	14.92	17.40	5.41	39.73
Finance, Insurance and Real Estate (% District GDP)	411	22.82	4.65	19.83	22.23	25.18	10.39	47.27
Public Services, Education and Health Care (% District GDP)	411	21.94	5.93	17.72	21.31	25.44	7.72	42.82

Figure 3: Non-Parametric Distribution of Income and Growth Rates Across German Districts, 1996-2011

(a) Real GDP Per Capita Distribution Across Districts



(b) Growth Rate Distribution Across Districts



5. Results

5.1 Baseline OLS Results

In Table 2, we present the effects of economic freedom on income levels and growth rates for the full sample of districts in two separate sets of OLS regressions with cluster-robust standard errors. In Panel A, the effects of economic freedom on income levels are presented emphasizing long-run effects while Panel B presents short-run effects of economic freedom on cross-district growth rates. In column (1), full-sample estimate indicates that 1 basis point increase in our synthetic index of economic freedom is associated with 13.3 percent increase in income level, respectively. The point estimate is both economically large and statistically significant at 1%. The size of the long-run effect economic freedom advocates a strong and persistent relationship with respect to income levels. In particular, 1 basis point differences in the synthetic index of economic freedom roughly corresponds to the observed quantitative difference between the Leer (Niedersachsen) and Altötting (Bayern) districts, which is approximately equivalent distance between the median and 80th percentile of the distribution. The full-sample estimate in column (1) indicates that raising the level of economic freedom on our synthetic index from low-freedom to high-freedom district is associated with 13.3 percent long-run increase in per capita income, ceteris paribus. In addition, our evidence readily suggests that the synthetic district-level index of economic freedom explains up to 30 percent of the per capita income variance across districts which implies that roughly one third of the per capita income variation can be attributed to the observed differences in the level of economic freedom.

The full-sample long-run effect of economic freedom on income level appears to be stable across multiple sub-samples. In columns (2) and (3), the districts from Bayern and Baden-Württemberg are split off the full sample. In spite of the noticeable effect drop from 0.133 to 0.125 and 0.098, the evidence confirms the beneficial effect of economic freedom on income level since the magnitude of the estimated effects are statistically significant at 1%, respectively. In columns (4) through (6), the underlying effect of economic freedom on income level jumps back to its full-sample counterpart once the districts from the states Brandenburg, Hessen and Mecklenburg-Vorpommern are excluded from the full sample.

Table 2: Economic Freedom, Growth and Income Levels Across German Districts

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Whole Sample	Excluded Subset:												
		Baden-Würrtemberg	Bayern	Brandenburg	Hessen	Mecklenburg-Vorpommern	Niedersachsen	Nordrhein-Westfallen	Rheinland-Pfalz	Saarland	Sachsen	Sachsen-Anhalt	Schleswig-Holstein	Thüringen
Panel A: Dependent Variable: Log GDP Per Capita														
Economic Freedom	.133*** (.036)	.125*** (.040)	.098*** (.032)	.140*** (.037)	.131*** (.039)	.137*** (.037)	.129*** (.043)	.152*** (.033)	.128*** (.041)	.133*** (.037)	.148*** (.033)	.136*** (.036)	.133*** (.038)	.141*** (.036)
Constant Term	10.083*** (.054)	10.064*** (.061)	10.048*** (.062)	10.096*** (.054)	10.071*** (.058)	10.099*** (.052)	10.081*** (.059)	10.053*** (.057)	10.080*** (.058)	10.083*** (.055)	10.098*** (.053)	10.095*** (.053)	10.084*** (.056)	10.106*** (.049)
Obs	407	363	312	389	381	389	362	353	371	401	394	393	392	384
Adj. R2	0.30	0.28	0.18	0.32	0.30	0.33	0.26	0.34	0.26	0.30	0.36	0.32	0.29	0.35
Wald χ2 Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Panel B: Dependent Variable: GDP Per Capita Growth Rate (%)														
Economic Freedom	.091*** (.033)	.104*** (.034)	.119*** (.032)	.089*** (.034)	.098*** (.035)	.082*** (.031)	.082** (.039)	.077*** (.037)	.085** (.038)	.091*** (.033)	.081*** (.033)	.084*** (.031)	.098*** (.035)	.085*** (.032)
Constant Term	1.613*** (.085)	1.617*** (.095)	1.622*** (.109)	1.581*** (.081)	1.624*** (.091)	1.580*** (.082)	1.649*** (.093)	1.648*** (.096)	1.640*** (.093)	1.620*** (.087)	1.601*** (.088)	1.581*** (.081)	1.633*** (.088)	1.581*** (.083)
Obs	407	363	312	389	381	389	362	353	371	401	394	393	392	384
Adj. R2	0.02	0.03	0.04	0.02	0.03	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.02
Wald χ2 Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
# District Clusters	407	363	312	389	381	389	362	353	371	401	407	407	407	407
# Administrative Clusters	37	33	30	36	34	36	33	32	34	36	34	34	36	36
# State Clusters	13	12	12	12	12	12	12	12	12	12	12	12	12	12

Notes: the table presents the effects of economic freedom on real GDP per capita and its growth rate over time. The standard errors are adjusted for arbitrary and non-random disturbances arising from heteroskedastic distribution of error variance and serially correlated residuals simultaneously at district level, administrative cluster level and state level using Cameron et. al. (2011) multiway clustering scheme and the appropriate moment-based empirical distribution function. Asterisks denote statsitically significant regression coefficients at 10% (*), 5% (**), and 1%(***), respectively.

In addition, the fraction of the cross-district variation in income levels tends to be stable in the range between 30 percent and 32 percent, respectively. Across columns (7) through (9), the districts from the states Niedersachsen, Nordrhein-Westfallen, and Rheinland-Pfalz are piecewise split off the core samples with no noticeable disparity in the underlying effect of economic freedom on income levels. As a general pattern, our evidence suggests that the main source of disparity in the magnitude of the effect arises from the composition of the sample. In particular, excluding the former West German states from the full samples tends to underscore the full-sample effect of economic freedom on growth while splitting former East German districts off the full sample counterpart tends to raise the magnitude of the effect considerably. Such a disparity is further indicated in columns (11), (12) and (14) when the districts from former east German states Sachsen, Sachsen-Anhalt and Thüringen are stepwise excluded from the core sample.

In Panel B, the short-run effects of economic freedom on growth are presented on the full samples and various state-level subsamples. In column (1), the point estimate suggests that 1 percentage point increase in the synthetic index of economic freedom is associated with 9.1 percent improvement in the rate of economic growth, respectively, holding everything else constant. The effect appears to be stable across sub-samples. Excluding the districts from the high-freedom states, namely Bayern and Baden-Württemberg, tends to raise the underlying magnitude of the effect considerably to 0.119 (cluster-robust S.E. = 0.032), and .104 (cluster-robust S.E = 0.040) compared to the baseline estimate in column (1). In columns (4) and (5), districts from the states Brandenburg and Hessen are split off the core sample. The exclusion does not seem to render the growth effect of economic freedom statistically indistinguishable from zero. Columns (6) and (7) exclude the districts from the states Mecklenburg-Vorpommern and Niedersachsen. The beneficial effect of greater economic freedom on growth appears to be intact. Column (8) splits the districts from the low-freedom state Nordrhein-Westfallen which leads to a notable 16% drop in the growth effect (=.077/.091) while the effect is statistically significant at 1%, and does not disappear across columns (9) through (14) when a similar exclusion checks are performed on the remaining states to examine the sensitivity of the subsample-level effect of freedom on growth to the baseline economic freedom parameter in column (1).

Our evidence advocates large growth gains from greater economic freedom. Taking our preferred specification in column (1), expanding the level of economic freedom on our synthetic index from the 25th percentile (Stormarn, Schleswig-Holstein) to the 75th percentile (Ortenaukreis, Baden-Württemberg) is associated with 1.35 percentage point increase in 12-year average rate of economic growth holding everything else constant. The estimated improvement in the rate of economic freedom does not take into account gains from TFP, investment, labor force participation and other channels that might change alongside the rising economic freedom which suggests that the estimated growth dividend from greater economic freedom is considerable for our setup with common institutional environment.

In Table 3, we examine the robustness of the key economic freedom parameters across sub-samples. Specifically, the robustness of the key paramaters is assessed by splitting district-free cities, city districts, northern districts, southern districts, and former east German districts off the full-sample specification. The effect of economic freedom on growth rate and income level is replicated on the core sample, large-state sample and small-state sample to further unravel the sensitivity of economic freedom in influencing per capita incomes and growth to the sample selection. Columns (1) through (5) indicate the effect of economic freedom on income level while columns (6) through (10) indicate the effect of economic freedom on growth rates. In

Panel A, the evidence confirms the positive effect of freedom on income level which does not appear to be driven either by the institutional type of district or by the geographic or historical composition of the sample. In Panel B, the effect of freedom on income appears to be stable in large-state sub-sample while the growth effect of economic freedom appear to be slightly weaker. Lastly, in Panel C, the beneficial effects of economic freedom on per capita incomes are confirmed on a small-state sample whereas the short-run effects of freedom on growth rate tends to be slightly weaker and marginally significant at borderline levels.

Table 3: Effects of Economic Freedom on Income Level and Growth of German Districts Across Various Subsamples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent Variable: Log GDP Per Capita					Dependent Variable: Economic Growth Rate (%)				
	Excluded Subset:									
	District-Free Cities	Urban Districts	Northern States	Southern States	Former East German States	District-Free Cities	Urban Districts	Northern States	Southern States	Former East German States
Panel A: Full Sample										
Economic Freedom	.119***	.153***	.196***	.100***	.165***	.077**	.044**	.061	.038	.042**
	(.032)	(.027)	(.015)	(.023)	(.022)	(.038)	(.023)	(.040)	(.027)	(.020)
Obs	293	325	230	200	321	293	325	230	200	321
Wald $\chi 2$ Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sectoral Covariates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Administrative-Fixed Effects (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
State-Fixed Effects (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Panel B: Large-State Sample										
Economic Freedom	.119***	.178***	.212***	.121***	.169***	.060*	.030*	.039	.019	.029
	(.032)	(.024)	(.005)	(.010)	(.028)	(.037)	(.017)	(.031)	(.029)	(.018)
Obs	195	208	161	104	251	195	208	161	104	251
Wald $\chi 2$ Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sectoral Covariates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Administrative-Fixed Effects (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
State-Fixed Effects (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Panel C: Small-State Sample										
Economic Freedom	.057	.086*	.152***	.048	.133***	.097	.054	.138	.049	.081
	(.052)	(.049)	(.018)	(.052)	(.032)	(.083)	(.050)	(.171)	(.050)	(.051)
Obs	98	117	69	96	70	98	117	69	96	70
Wald $\chi 2$ Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sectoral Covariates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Administrative-Fixed Effects (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
State-Fixed Effects (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: the table presents the effects of economic freefom on income level and its growth rate over time across various sub-samples. The standard errors are robust against heteroskedasticity and serially correlated stochastic disturbances using the non-nested empirical distribution function based on the moment conditions and Cameron et. al. (2011) multiway clustering scheme. Asterisks denote statistically significant regression coefficients at 10% (*), 5% (**), and 1% (***), respectively

The core effects of economic freedom are not driven by region-specific effects or by the institutional type of districts. The underlying coefficient on economic freedom is the .10-.16 range across (long-run) income level regression specifications, and in the .042-.077 range for the cross-district growth regressions. The effects of economic freedom on both economic outcomes tend to be particularly stronger in larger states and slightly weaker in smaller states.

5.2 Effect Heterogeneity

In Table 4, the quantile regression estimates of the underlying cross-district growth and income model specifications from (3.1) and (3.2) are presented. Specifically, the quantile-specific point estimates of the relationship between economic freedom and both outcome variables are presented for the 25th percentile, median of the distribution, 75th percentile, and 90th percentile, respectively.

Table 4: Effects of Economic Freedom on Income Level and Growth Rate Across Different Quantiles of the Outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Dependent Variable: Log GDP Per Capita					Dependent Variable: Economic Growth Rate				
	OLS	Quantile Regression Function				OLS	Quantile Regression Function			
	Whole Sample	0.25	0.50	0.75	0.90	Whole Sample	0.25	0.50	0.75	0.90
Panel A: Full Effects of Economic Freedom										
Economic Freedom	.142*** (.009)	.142*** (.009)	.126*** (.008)	.141*** (.010)	.131*** (.010)	.040** (.018)	.086*** (.027)	.094*** (.029)	.087*** (.024)	.190*** (.028)
Obs	407	407	407	407	407	407	407	407	407	407
Adj. R2	0.84	0.83	0.79	0.79	0.78	0.47	0.31	0.31	0.32	0.31
Sectoral Covariates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Administrative-Fixed Effects (p-value)	YES (0.000)	NO	NO	NO	NO	YES (0.000)	NO	NO	NO	NO
State-Fixed Effects (p-value)	YES (0.000	NO	NO	NO	NO	YES (0.000)	NO	NO	NO	NO
Machado-Santos Silva Heteroskedasticity Test (p-value)		0.000	0.000	0.000	0.000		0.052	0.042	0.942	0.000

Notes: the table presents the effects of economic freedom on real GDP per capita and its growth rate over time across different quantiles of each outcome. The standard errors are cluster-robust against the multiple spatial dimensions of heteroskedasticity and serially correlated stochastic disturbances using Machado and Santos-Silva (2015) quantile regression function. Asterisks denote statistically significant regression coefficients at 10% (*), 5% (**), and 1% (***), respectively.

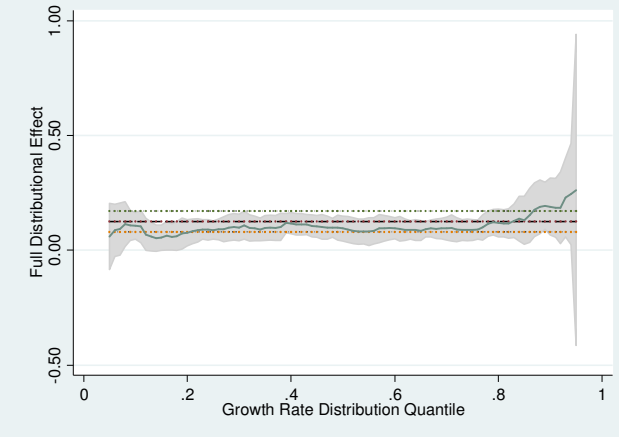
Columns (1) through (5) present the quantile-specific effect of economic freedom on income level. Each point estimates indicates the response of income level to the change in economic freedom at various tails of the outcome variable. In column (1), full-sample specification indicates that 1 basis point improvement in the index of economic freedom is associated with 14 percent increase in income level, respectively, ceteris paribus. In column (2), the effect of economic freedom on income level at the 25th percentile is broadly aligned with the full-sample OLS estimate with a similar magnitude of the standard errors. In column (3), the effect at the median is slightly lower compared to the 25th percentile. In particular, the effect of economic freedom on income level at the median of the outcome distribution drops by 10 basis points

(=.126/142) indicating a slightly weaker long-run effect of economic freedom. In column (4), the long-run effect of the economic freedom tends to rebound compared to the median estimate in column (3) and tends to recover the effect magnitude from the 25th percentile of the distribution. In column (5), the point estimate at the 90th percentile of the outcome distribution tends to drop by 7.1 basis points, and suggest that improving the level of economic freedom in the 90th percentile of district-level income distribution tends to boost per capita incomes in the respective percentile by 13.1 percent, respectively. The behavior of the quantile-specific point estimates across columns (1) through (5) clearly suggests that low-freedom districts tend to gain disproportionately from higher economic freedom, the effect tends to weaken at the median, recover at the 75th percentile of the distribution while it drops slightly in the upper tail of the district-level per capita income distribution.

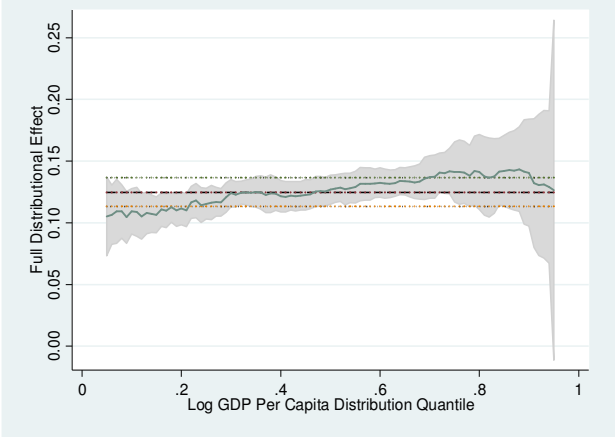
Columns (6) through (10) present the quantile-specific short-run effect of economic freedom on district-level growth rates. Compared to the long-run effects across columns (1) through (5), the evidence suggests the quantitative magnitude of the effect is substantially smaller. In column (6), the full-sample freedom-growth estimate suggests that 1 basis point improvement in the synthetic index of economic freedom is associated with 4 percent rise in the short-run growth rate. Compared to its long-run counterpart, the short-run effect of economic freedom unveils substantial heterogeneity across various tails of the growth distribution. Column (7) reveals that improving economic freedom by 1 basis point in the 25th percentile of growth distribution is associated with 8.6 percent expansion in short-run growth rate. The short-run effect gains further strength at the median of the growth distribution, indicated by column (8), where the equivalent 1 basis point improvement in economic freedom leads to 9.4 percent increase in growth rate. In column (9), the effect at the 75th percentile of the distribution tends to drop back to the 25th percentile effect magnitude while the effect gains notable strength in column (10) where a 1 basis point improvement in the synthetic index of economic freedom is associated with 19 percent increase in growth rate. The point estimate in column (10) highlights considerable gains from greater economic freedom in the upper tail of growth distribution compared to the lower tails. Figure 4 displays the full distributional effect of economic freedom on growth and income level simulated at micro percentiles of the outcome variables, i.e. by breaking down each percentile into one hundred decimal points to further address the inter-percentile effect variation.

Figure 4: Full Distributional Effect of Economic Freedom Across Micro-Percentiles of the District-Level Distribution

(a) Effect on Growth Rate (Short-Run Effect)



(b) Effect on Per Capita Income (Long-Run Effect)



5.3 Counterfactual Scenario

The ultimate question pertaining to the robustness of our core estimates concerns the counterfactual scenario. Would German districts with below-average level of economic freedom significantly improve growth rates and income level if they moved up the ladder of economic freedom? We construct a counterfactual scenario by focusing on the districts with the level of economic freedom on the synthetic index below the 90th percentile to separate high-freedom districts from low-freedom ones. The level of economic freedom at the 90th percentile roughly corresponds to the level of economic freedom observed in the Rosenheim district in Upper Bavaria. The counterfactual scenario hinges on the level of economic freedom attained by a sizeable fraction of districts. Specifying the counterfactual threshold at the highest level of economic freedom observed in our sample (corresponding to Ansbach [Bavaria] and Koblenz [Rheinland-Pfalz] districts) is arguably implausible since an array of observable and idiosyncratic characteristics can be the driving force behind top level of economic freedom in both districts which cannot be plausible realized by the districts outside the top 10% of the distribution. Our counterfactual scenario invokes the core growth and income level specifications in (3.1) and (3.2):

$$\ln y^{Counterfactual}_{i\in\left\{1\left[EF<Q^{EF}_{90}\right]\right\},j,k,l} = \ln A + \hat{\gamma}_1 \cdot EF^{Q(.90)}_{j,k,l} + \mathbf{X}'\beta + \sum_{j=1}^{J}\hat{\phi}_j \cdot 1[i\in j] + \sum_{k=1}^{K}\hat{\alpha}_k \cdot 1[i\in j\in k] + \sum_{l=1}^{L}\hat{\Theta}_l \cdot 1[i\in j\in k\in l] + \varepsilon_{i,j,k,l} \tag{5.1}$$

$$\Delta \ln y^{Counterfactual}_{i\in\left\{1\left[EF<Q^{EF}_{90}\right]\right\},j,k,l} = \ln A + \hat{\lambda}_1 \cdot EF^{Q(.90)}_{j,k,l} + \mathbf{X}'\alpha + \sum_{j=1}^{J}\mu_j \cdot 1[i\in j] + \sum_{k=1}^{K}\theta_k \cdot 1[i\in j\in k] + \sum_{l=1}^{L}\Gamma_l \cdot 1[i\in j\in k\in l] + u_{i,j,k,l} \tag{5.2}$$

where $\ln y^{Counterfactual}$ denotes the counterfactual level of income resulting from expanding the level of economic freedom in the 90th percentile of the full-sample distribution, and $\Delta \ln y^{Counterfactual}$ is the equivalent counterfactual growth rate. The sample consist of the district-level observations below the 90th percentile economic freedom threshold, indicated by $i\in\left\{1\left[EF<Q^{EF}_{.90}\right]\right\}, j,k,l$ which implies that the district-level observations with the level economic freedom in the top 10% are omitted from the counterfactual scenario. Our benchmark specification used to construct the counterfactual scenario comprises full-sample model specification with the full set of covariates and Cameron et. al. (2011) multiway clustering scheme with standard errors clustered at district, administrative unit, regional government and state (Länder) level to prevent the serially correlated stochastic disturbances from undermining the inference on the two key parameters of interest, $\hat{\gamma}_1$ and $\hat{\lambda}_1$. Using a full-sample cross-district income and growth model specification with a multiway-clustered standard errors, we obtain $\hat{\gamma}_1 = .102$ (cluster-robust S.E. = .019) and $\hat{\lambda}_1 = .105$ (cluster-robust S.E. = .022). Excluding covariates, the variation in the synthetic index of economic freedom accounts for up to 30 percent of differences in income level across districts, and for up to 3 percent of differences in cross-district growth rates. We use the point estimates on $\hat{\lambda}_1$ and $\hat{\gamma}_1$ to construct the counterfactual district-level income and growth outcomes taking into account the outcomes' variance driven by the structural covariates.

Figure 5: Counterfactual GDP Per Capita at the 90th Percentile of Economic Freedom Distribution

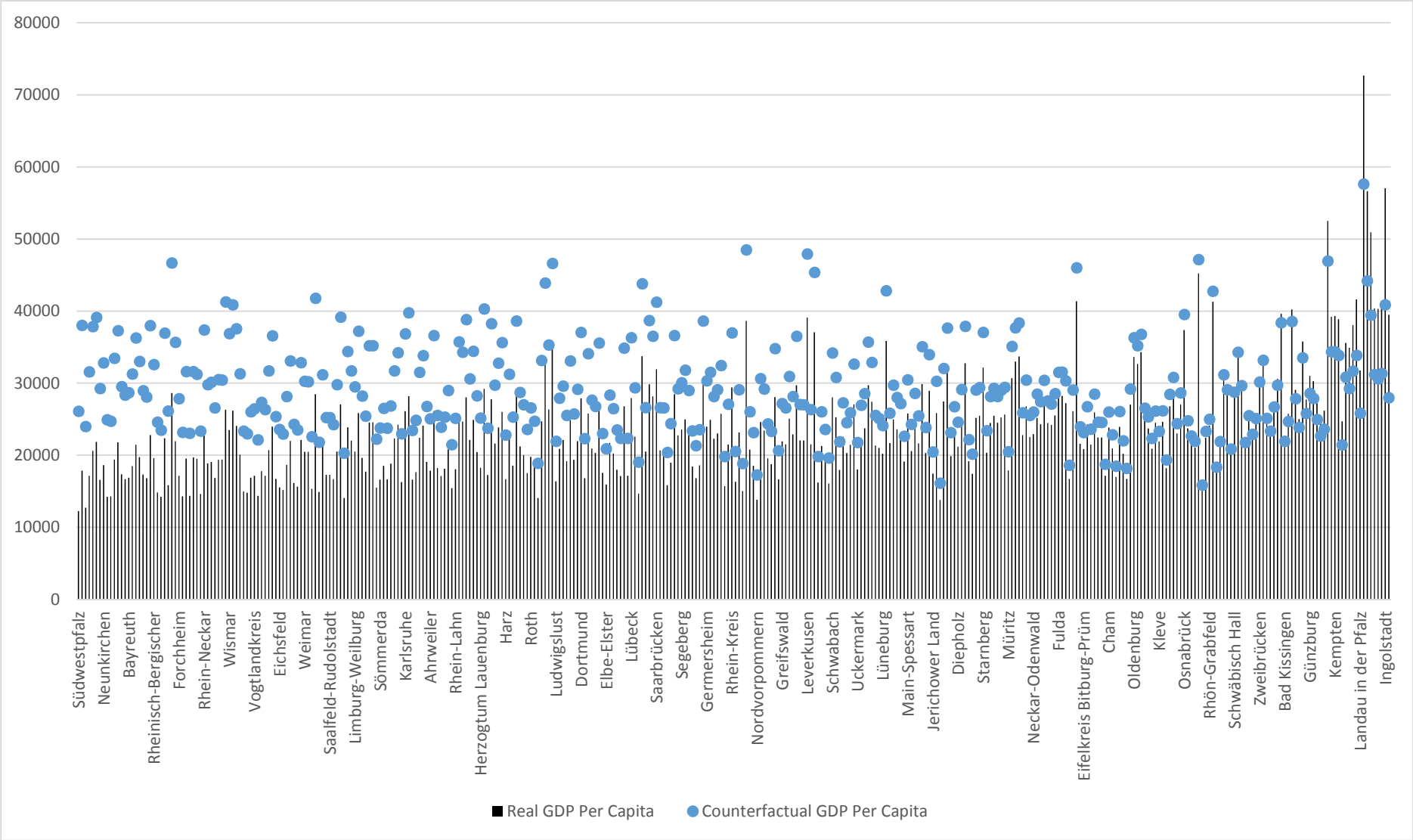
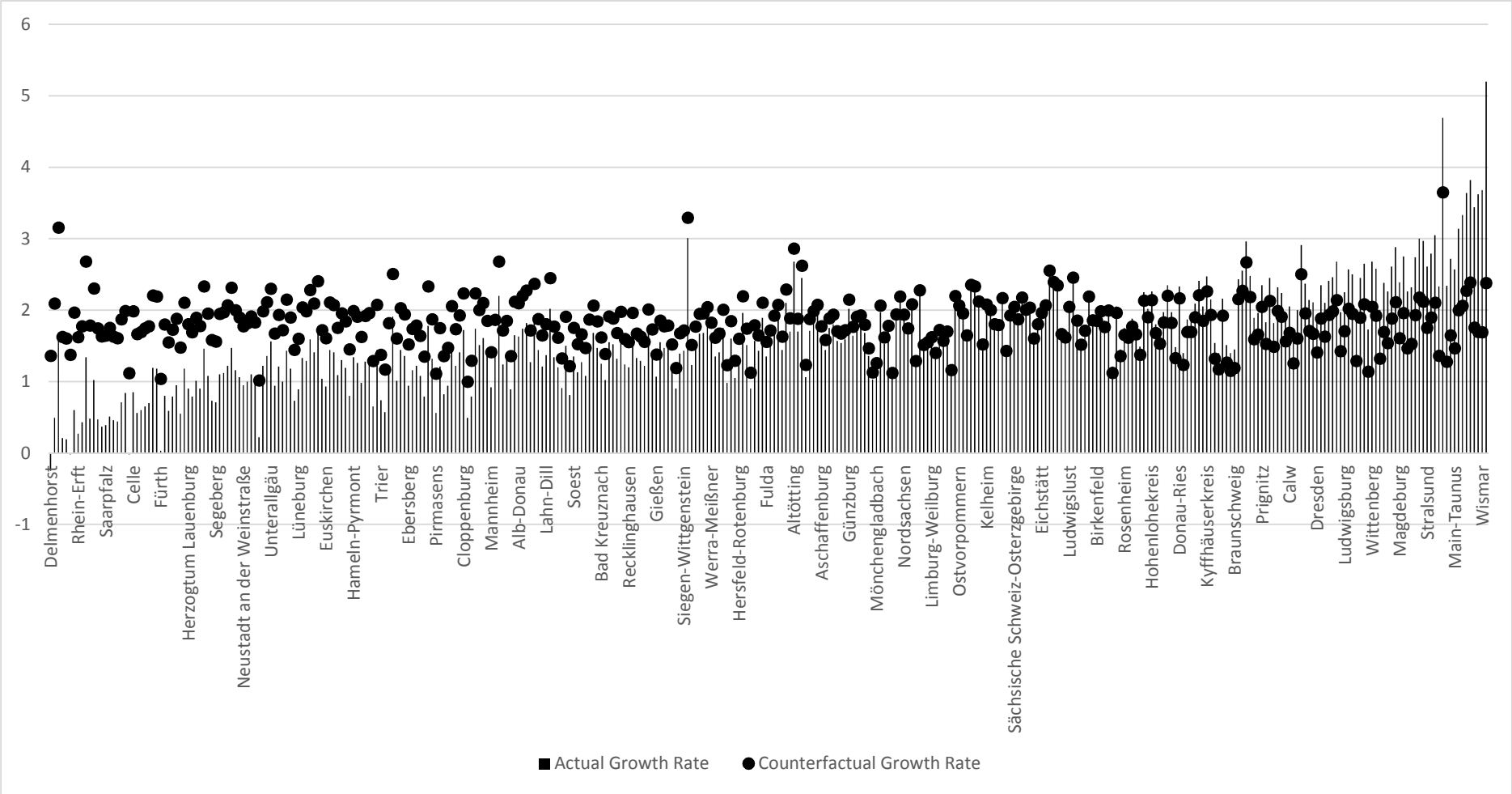


Figure 6: Counterfactual Growth Rates at the 90th Percentile of Economic Freedom Distribution

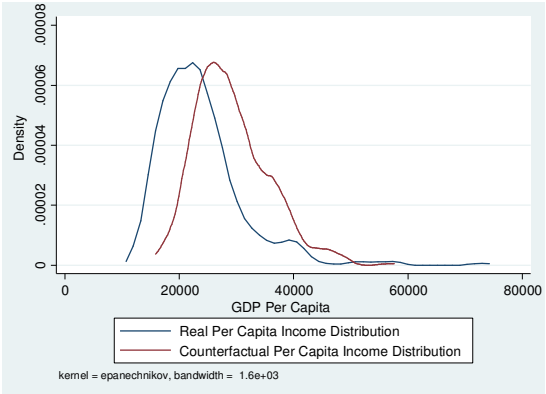


In Figure 5, the counterfactual district-level distribution of per capita income is presented. The evidence suggests the transition to the 90th percentile of economic freedom (corresponding to Rosenheim district) is associated with marked gains across the full cross-section of districts. For the districts characterized by low level of economic freedom, the gains from moving into the 90th percentile of economic freedom distribution are remarkable. For the Herne district, the counterfactual scenario indicates 113 percent increase in per capita income following the transition to the 90th percentile of the economic freedom distribution. Similarly, for the low-freedom districts Oberhausen and Südwestpfalz, our counterfactual estimates indicate 83 percent and 113 percent improvement in per capita incomes following the transition to the 90th percentile of economic freedom. In total, the counterfactual scenario suggests per capita income level is higher than the actual level in 89 percent of the districts with the below-90th percentile distribution of economic freedom. The remaining 11 percent of the districts are either characterized by exceptionally high income levels (München, Frankfurt am Main, Darmstadt) or display the counterfactual outcome very close to the actual level. In the counterfactual scenario, the Gini coefficient for the cross-district per capita income distributions drops from by 3 basis points (from 0.15 to 0.12) suggesting that improving the level of economic freedom to the 90th percentile in below-cutoff districts tends to partially decrease the cross-district per capita income inequality.

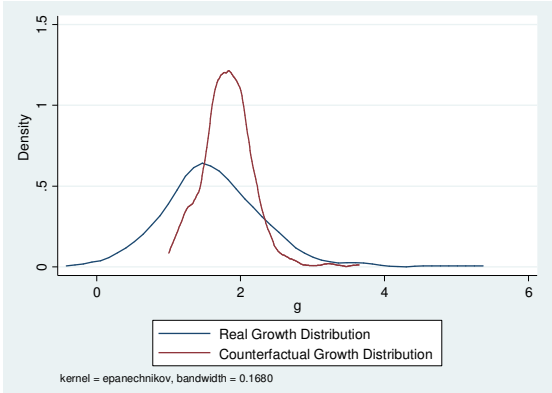
In Figure 6, we replicate the counterfactual scenario for the cross-district growth model and examine the cross-sectional growth differences if the below-90th percentile districts improved the level of economic freedom to the 90th percentile. The evidence unveils large and persistent gains in the rate of economic growth in the counterfactual scenario. About 66 percent of the districts tend to experience higher rate of economic growth compared to the actual rate. The most substantial improvement in the rate of economic growth is indicated for the districts Delmenhorst, Leverkusen, Ludwigshafen am Rhein, Pinneberg and Freising where we observed an improvement in the rate of economic growth by at least 1.4 percentage points. The remaining third of the districts again experience either exceptionally high rates of growth as observed in the districts Ingolstadt, Demmin and Spree-Neiße or the counterfactual rates of growth closely matched with the actual rates. The counterfactual outcomes highlight a notable decrease in cross-district growth inequality following the transition to the 90th percentile of economic freedom. In particular, the cross-district Gini coefficient on growth rates tends to drop by 13 percentage points, i.e. from 0.23 to 0.10, which advocates large-scale reduction in cross-district growth disparities in the counterfactual scenario. The actual and counterfactual distributions of cross-district outcomes are displayed in Figure 7.

Figure 7: Counterfactual Outcome Distributions

(a) Cross-District Per Capita Income Distribution



(b) Cross-District Growth Distribution



6. Conclusion

The notion that greater economic freedom is beneficial for growth and income levels has received a widely acclaimed scholarly attention. However, most of the studies dealing with the relationship between economic freedom and growth establish such claim on the basis of cross-country variation in economic freedom and economic outcomes. The notion that economic freedom shapes economic growth and income levels under common institutional environment is much less clear and warrants the conclusive quantification.

In this paper, we revisit the relationship between economic freedom, per capita incomes and growth for a cross-section of 407 German districts for the period 1995-2010. To this end, we propose a new synthetic index of economic freedom consisting of ten different components capturing the sub-national variation in the regulatory environment, income and property taxation, public debt, shadow economy and public sector employment. The constructed synthetic index of economic freedom exhibits a substantial spatial variation across districts and rejects the traditional notion that former east German districts tend to suffer from the historical legacy of economic institutions not conducive to economic growth. On the contrary, the synthetic index reveals a a reversal of the economic freedom pattern. Former east German and southern German districts tend to have markedly higher level of economic freedom than their northern and western counterparts.

Our results show that greater economic freedom fuels both short-run growth rate and long-run income level. In our preferred specification, 1 basis point improvement in the index of economic freedom is associated with 9.1 percent increase in growth rate, and with 13.3 percent increase in income level. The effect of economic freedom does not depend on the district-level sectoral structure, sample selection or geographic composition of the sample. In addition, the effect of economic freedom does not appear to be driven by outliers, and does not seem to sensitive to the heterogeneity of the underlying relationship across various tails of the district-level per capita income- and growth distribution.

We further assess the potential economic gains of greater economic freedom and build a counterfactual scenario. The counterfactual scenario aims to examine the income- and growth gains from greater economic freedom by moving the districts with below-90^{th} percentile level of economic freedom to the 90^{th} percentile, and estimating the hypothetical gains. The evidence clearly suggests that in the counterfactual scenario, per capita income level outperforms its actual counterpart in 89 percent of districts. The gains are noticeably stronger and quantitatively large in the districts at the bottom tail of the per capita income distribution. We also find that the counterfactual growth rates exceed the actual ones in more than two thirds of districts which testifies to the robust and beneficial effect of economic freedom on growth and income levels.

However, the origins of economic freedom under common institutional environment in relation to the political, cultural and historical factors remain less clear. Nevertheless, such an inquiry might unravel the sources of institutional differences under common institutional design and clearly comprise a promising research area to pursue in the future.

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Appendix A1: Synthetic Index of Economic Freedom in a Cross-Section of German Districts

Rank	District	Region	State	Syntheic Index of Economic Freedom
1	Koblenz	Koblenz	Rheinland-Pfalz	4.447
2	Ansbach	Mittelfranken	Bayern	3.407
3	Wilhelmshaven	Weser-Ems	Niedersachsen	3.270
4	Jena	Thüringen	Thüringen	3.242
5	Bayreuth	Oberfranken	Bayern	2.990
6	Kiel	Schleswig-Holstein	Schleswig-Holstein	2.913
7	Schweinfurt	Unterfranken	Bayern	2.887
8	Bamberg	Oberfranken	Bayern	2.782
9	Regensburg	Oberpfalz	Bayern	2.771
10	Coburg	Oberfranken	Bayern	2.753
11	Würzburg	Unterfranken	Bayern	2.605
12	Görlitz	Dresden	Sachsen	2.591
13	Karlsruhe	Karlsruhe	Baden-Württemberg	2.551
14	Flensburg	Schleswig-Holstein	Schleswig-Holstein	2.498
15	Amberg	Oberpfalz	Bayern	2.491
16	Ulm	Tübingen	Baden-Württemberg	2.486
17	Erzgebirgkreis	Chemnitz	Sachsen	2.426
18	Frankfurt a.d. Oder	Brandenburg	Brandenburg	2.377
19	Potsdam	Brandenburg	Brandenburg	2.345
20	Zwickau	Chemnitz	Sachsen	2.313
21	Potsdam-Mittelmark	Brandenburg	Brandenburg	2.291
22	Erfurt	Thüringen	Thüringen	2.278
23	Bautzen	Dresden	Sachsen	2.262
24	München	Oberbayern	Bayern	2.237
25	Landshut	Niederbayern	Bayern	2.207
26	Erlangen	Mittelfranken	Bayern	2.205
27	Wolfsburg	Braunschweig	Niedersachsen	2.188
28	Stuttgart	Stuttgart	Baden-Württemberg	2.174
29	Düsseldorf	Düsseldorf	Nordrhein-Westfallen	2.173
30	Passau	Niederbayern	Bayern	2.172
31	Aschaffenburg	Unterfranken	Bayern	2.162
32	Schwerin	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	2.100
33	Heilbronn	Stuttgart	Baden-Württemberg	2.064
34	Memmingen	Schwaben	Bayern	2.062
35	Teltow-Fläming	Brandenburg	Brandenburg	2.053
36	Weiden i.d. Opf	Oberpfalz	Bayern	2.008
37	Hannover	Hannover	Niedersachsen	1.969
38	Wiesbaden	Darmstadt	Hessen	1.904
39	Neubrandenburg	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	1.865

40	Heidelberg	Karlsruhe	Baden-Württemberg	1.834
		90th Percentile		
41	Rosenheim	Oberbayern	Bayern	1.806
42	Rostock	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	1.712
43	Bonn	Köln	Nordrhein-Westfallen	1.709
44	Oder-Spree	Brandenburg	Brandenburg	1.705
45	Darmstadt	Darmstadt	Hessen	1.698
46	Kempten	Schwaben	Bayern	1.696
47	Magdeburg	Magdeburg	Sachsen-Anhalt	1.677
48	Oldenburg	Weser-Ems	Niedersachsen	1.658
49	Ingolstadt	Oberbayern	Bayern	1.634
50	Greifswald	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	1.627
51	Meißen	Dresden	Sachsen	1.594
52	Emden	Weser-Ems	Niedersachsen	1.560
53	Frankfurt am Main	Darmstadt	Hessen	1.556
54	Dresden	Dresden	Sachsen	1.512
55	Sächsische Schweiz-Osterzgebirge	Dresden	Sachsen	1.500
56	Stralsund	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	1.483
57	Straubing	Niederbayern	Bayern	1.431
58	Dessau-Roßlau	Dessau	Sachsen-Anhalt	1.359
59	Kaufbeuren	Schwaben	Bayern	1.325
60	Osnabrück	Weser-Ems	Niedersachsen	1.323
61	Vogtlandkreis	Chemnitz	Sachsen	1.319
62	Leipzig	Leipzig	Sachsen	1.292
63	Aubsburg	Schwaben	Bayern	1.287
64	Suhl	Thüringen	Thüringen	1.286
65	Deggendorf	Niederbayern	Bayern	1.272
66	Cottbus	Brandenburg	Brandenburg	1.262
67	Gera	Thüringen	Thüringen	1.248
68	Sigmaringen	Tübingen	Baden-Württemberg	1.220
69	Freising	Oberbayern	Bayern	1.202
70	Hof	Oberfranken	Bayern	1.187
71	Münster	Münster	Nordrhein-Westfallen	1.157
72	Mannheim	Karlsruhe	Baden-Württemberg	1.129
73	Weimar	Thüringen	Thüringen	1.126
74	Günzburg	Schwaben	Bayern	1.107
75	Dingolfing-Landau	Niederbayern	Bayern	1.100
76	München	Oberbayern	Bayern	1.096
77	Fulda	Kassel	Hessen	1.051
78	Biberach	Tübingen	Baden-Württemberg	1.040
79	Halle	Halle	Sachsen-Anhalt	1.022
80	Schmalkalden-Meiningen	Thüringen	Thüringen	1.001
81	Chemitz	Chemnitz	Sachsen	1.001

		80th Percentile		
82	Kassel	Kassel	Hessen	0.989
83	Steinburg	Schleswig-Holstein	Schleswig-Holstein	0.971
84	Braunschweig	Braunschweig	Niedersachsen	0.946
85	Elbe-Elster	Brandenburg	Brandenburg	0.945
86	Nordfriesland	Schleswig-Holstein	Schleswig-Holstein	0.940
87	Stendal	Magdeburg	Sachsen-Anhalt	0.909
88	Altötting	Oberbayern	Bayern	0.909
89	Freiburg im Breisgau	Freiburg	Baden-Württemberg	0.899
90	Eisenach	Thüringen	Thüringen	0.892
91	Landau in der Pfalz	Rheinhessen-Pfalz	Rheinland-Pfalz	0.887
92	Mainz	Rheinhessen-Pfalz	Rheinland-Pfalz	0.881
93	Uecker-Randow	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	0.868
94	Güstrow	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	0.864
95	Donau-Ries	Schwaben	Bayern	0.838
96	Zweibrücken	Rheinhessen-Pfalz	Rheinland-Pfalz	0.815
97	Soltau-Fallingbostel	Lüneburg	Niedersachsen	0.814
98	Gotha	Thüringen	Thüringen	0.784
99	Jerichower Land	Magdeburg	Sachsen-Anhalt	0.782
100	Wismar	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	0.773
101	Saale-Orla	Thüringen	Thüringen	0.772
102	Mittelsachsen	Chemnitz	Sachsen	0.766
103	Ortenaukreis	Freiburg	Baden-Württemberg	0.753
104	Neumünster	Schleswig-Holstein	Schleswig-Holstein	0.730
105	Vechta	Weser-Ems	Niedersachsen	0.724
106	Wartburgkreis	Thüringen	Thüringen	0.707
107	Speyer	Rheinhessen-Pfalz	Rheinland-Pfalz	0.706
108	Neuburg-Schrobenhausen	Oberbayern	Bayern	0.702
109	Dahme-Spreewald	Brandenburg	Brandenburg	0.689
110	Kyffhäuserkreis	Thüringen	Thüringen	0.675
111	Tuttlingen	Freiburg	Baden-Württemberg	0.671
112	Emsland	Weser-Ems	Niedersachsen	0.663
113	Rottweil	Freiburg	Baden-Württemberg	0.653
114	Rügen	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	0.652
115	Ludwigshafen am Rhein	Rheinhessen-Pfalz	Rheinland-Pfalz	0.628
116	Schwäbisch Hall	Stuttgart	Baden-Württemberg	0.621
117	Demmin	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	0.601
118	Ravensburg	Tübingen	Baden-Württemberg	0.589
119	Rhein-Hunsrück	Koblenz	Rheinland-Pfalz	0.567
120	Saarpfalz	Saarland	Saarland	0.562
		70th Percentile		
121	Saalekreis	Halle	Sachsen-Anhalt	0.555
122	Saalfeld-Rudolstadt	Thüringen	Thüringen	0.551

123	Bad Kissingen	Unterfranken	Bayern	0.551
124	Schwandorf	Oberpfalz	Bayern	0.546
125	Rendsburg-Eckernförde	Schleswig-Holstein	Schleswig-Holstein	0.538
126	Trier	Trier	Rheinland-Pfalz	0.533
127	Main-Tauber-Kreis	Stuttgart	Baden-Württemberg	0.523
128	Hersfeld-Rotenburg	Kassel	Hessen	0.522
129	Lichtenfels	Oberfranken	Bayern	0.520
130	Neumarkt i.d. Opf	Oberpfalz	Bayern	0.518
131	Ditmarschen	Schleswig-Holstein	Schleswig-Holstein	0.502
132	Burgenlandkreis	Halle	Sachsen-Anhalt	0.494
133	Oberspreewald-Lausitz	Brandenburg	Brandenburg	0.480
134	Nürnberg	Mittelfranken	Bayern	0.475
135	Uckermark	Brandenburg	Brandenburg	0.467
136	Saarbrücken	Saarland	Saarland	0.460
137	Pforzheim	Karlsruhe	Baden-Württemberg	0.459
138	Cham	Oberpfalz	Bayern	0.457
139	Baden	Karlsruhe	Baden-Württemberg	0.453
140	Ostalbkreis	Stuttgart	Baden-Württemberg	0.439
141	Nordhausen	Thüringen	Thüringen	0.428
142	Böblingen	Stuttgart	Baden-Württemberg	0.420
143	Rhön-Grabfeld	Unterfranken	Bayern	0.417
144	Unstrut-Hainrich	Thüringen	Thüringen	0.414
145	Altenburger Land	Thüringen	Thüringen	0.409
146	Gütersloh	Detmold	Nordrhein-Westfallen	0.407
147	Eichsfeld	Thüringen	Thüringen	0.405
148	Köln	Köln	Nordrhein-Westfallen	0.395
149	Cochem-Zell	Koblenz	Rheinland-Pfalz	0.392
150	Ludwigslust	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	0.372
151	Kitzingen	Unterfranken	Bayern	0.368
152	Altmarkkreis	Magdeburg	Sachsen-Anhalt	0.363
153	Marburg-Biedenkopf	Gießen	Hessen	0.354
154	Ilm	Thüringen	Thüringen	0.353
155	Hohenlohekreis	Stuttgart	Baden-Württemberg	0.350
156	Saarlouis	Saarland	Saarland	0.349
157	Leipzig	Leipzig	Sachsen	0.339
158	Main-Spessart	Unterfranken	Bayern	0.323
159	Börde	Magdeburg	Sachsen-Anhalt	0.312
160	Brandenburg a.d. Havel	Brandenburg	Brandenburg	0.290
161	Waldeck-Frankenburg	Kassel	Hessen	0.279
162	Freudenstadt	Karlsruhe	Baden-Württemberg	0.275
		60th Percentile		
163	Westerwaldkreis	Koblenz	Rheinland-Pfalz	0.250
164	Pfaffenhofen a.d. Ilm	Oberbayern	Bayern	0.249
165	Sonneberg	Thüringen	Thüringen	0.244
166	Hildburghausen	Thüringen	Thüringen	0.236

167	Berchtesgadner Land	Oberbayern	Bayern	0.236
168	Konstanz	Freiburg	Baden-Württemberg	0.234
169	Olpe	Arnsberg	Nordrhein-Westfallen	0.206
170	Kulmbach	Oberfranken	Bayern	0.202
171	Schwarzwald-Baar	Freiburg	Baden-Württemberg	0.183
172	Traunstein	Oberbayern	Bayern	0.174
173	Haßberge	Unterfranken	Bayern	0.170
174	Lahn-Dill	Gießen	Hessen	0.157
175	Vulkaneifel	Trier	Rheinland-Pfalz	0.155
176	Rottal-Inn	Niederbayern	Bayern	0.131
177	Rastaat	Karlsruhe	Baden-Württemberg	0.129
178	Minden-Lübbecke	Detmold	Nordrhein-Westfallen	0.126
179	Nordsachsen	Leipzig	Sachsen	0.123
180	Weißenburg-Gunzenhausen	Mittelfranken	Bayern	0.120
181	Weilheim-Schongau	Oberbayern	Bayern	0.114
182	Main-Taunus	Darmstadt	Hessen	0.113
183	Paderborn	Detmold	Nordrhein-Westfallen	0.095
184	Gießen	Gießen	Hessen	0.074
185	Zolleranalbkreis	Tübingen	Baden-Württemberg	0.068
186	Schwabach	Mittelfranken	Bayern	0.064
187	Kleve	Düsseldorf	Nordrhein-Westfallen	0.062
188	Bodenseekreis	Tübingen	Baden-Württemberg	0.061
189	Bernkastel-Wittlich	Trier	Rheinland-Pfalz	0.058
190	Neckar-Odenwald	Karlsruhe	Baden-Württemberg	0.023
191	Coesfeld	Münster	Nordrhein-Westfallen	0.012
192	Schwalm-Eder	Kassel	Hessen	0.012
193	Eifelkreis Bitburg-Prüm	Trier	Rheinland-Pfalz	0.008
194	Greiz	Thüringen	Thüringen	0.000
195	Bielefeld	Detmold	Nordrhein-Westfallen	0.000
196	Saale-Holzland	Thüringen	Thüringen	-0.013
197	Kronach	Oberfranken	Bayern	-0.021
198	Salzgitter	Braunschweig	Niedersachsen	-0.023
199	Siegen-Wittgenstein	Arnsberg	Nordrhein-Westfallen	-0.023
200	Wittenberg	Dessau	Sachsen-Anhalt	-0.030
201	Mühldorf am Inn	Oberbayern	Bayern	-0.036
202	Müritz	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.041
203	Karlsruhe	Karlsruhe	Baden-Württemberg	-0.054
		50th Percentile		
204	Oberhavel	Brandenburg	Brandenburg	-0.064
205	Rottenburg-Wümme	Lüneburg	Niedersachsen	-0.067
206	Leer	Weser-Ems	Niedersachsen	-0.067
207	Unterallgäu	Schwaben	Bayern	-0.072
208	Leverkusen	Köln	Nordrhein-Westfallen	-0.072
209	Nordvorpommern	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.077

210	Bad Doberan	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.082
211	Offenbach am Main	Darmstadt	Hessen	-0.083
212	Holzminden	Hannover	Niedersachsen	-0.087
213	Sömmerda	Thüringen	Thüringen	-0.095
214	Parchim	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.099
215	Germersheim	Rheinhessen-Pfalz	Rheinland-Pfalz	-0.103
216	Salzlandkreis	Magdeburg	Sachsen-Anhalt	-0.113
217	Spree-Neiße	Brandenburg	Brandenburg	-0.123
218	Landsberg am Lech	Oberbayern	Bayern	-0.142
219	Schleswig-Flensburg	Schleswig-Holstein	Schleswig-Holstein	-0.149
220	Segeberg	Schleswig-Holstein	Schleswig-Holstein	-0.149
221	Birkenfeld	Koblenz	Rheinland-Pfalz	-0.150
222	Wittmund	Weser-Ems	Niedersachsen	-0.156
223	Harz	Magdeburg	Sachsen-Anhalt	-0.159
224	Reutlingen	Tübingen	Baden-Württemberg	-0.163
225	Lübeck	Schleswig-Holstein	Schleswig-Holstein	-0.167
226	Kelheim	Niederbayern	Bayern	-0.171
227	Tischenreuth	Oberpfalz	Bayern	-0.177
228	Neustadt an der Weinstraße	Rheinhessen-Pfalz	Rheinland-Pfalz	-0.180
229	Mansfeld-Südharz	Halle	Sachsen-Anhalt	-0.184
230	Höxter	Detmold	Nordrhein-Westfallen	-0.185
231	Borken	Münster	Nordrhein-Westfallen	-0.190
232	Hochsauerlandkreis	Arnsberg	Nordrhein-Westfallen	-0.191
233	Merzig-Wadern	Saarland	Saarland	-0.191
234	Anhalt-Bitterfeld	Dessau	Sachsen-Anhalt	-0.195
235	Groß-Gerau	Darmstadt	Hessen	-0.196
236	Freyung-Grafenau	Niederbayern	Bayern	-0.198
237	Heilbronn	Stuttgart	Baden-Württemberg	-0.201
238	Starnberg	Oberbayern	Bayern	-0.207
239	Ludwigsburg	Stuttgart	Baden-Württemberg	-0.209
240	Märkisch-Oderland	Brandenburg	Brandenburg	-0.215
241	Neustadt a.d. Waldnaab	Oberpfalz	Bayern	-0.221
242	Heidenheim	Stuttgart	Baden-Württemberg	-0.223
243	Dillingen a.d. Donau	Schwaben	Bayern	-0.231
		40th Percentile		
244	Cloppenburg	Weser-Ems	Niedersachsen	-0.240
245	Nienburg-Weser	Hannover	Niedersachsen	-0.242
246	Herford	Detmold	Nordrhein-Westfallen	-0.246
247	Soest	Arnsberg	Nordrhein-Westfallen	-0.273
248	Nordwestmecklenburg	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.301
249	Miltenberg	Unterfranken	Bayern	-0.305
250	Landshut	Niederbayern	Bayern	-0.306
251	Ansbach	Mittelfranken	Bayern	-0.320

252	Esslingen	Stuttgart	Baden-Württemberg	-0.320
253	Frankenthal-Pfalz	Rheinhessen-Pfalz	Rheinland-Pfalz	-0.325
254	Hof	Oberfranken	Bayern	-0.325
255	Coburg	Oberfranken	Bayern	-0.334
256	Märkischer Kreis	Arnsberg	Nordrhein-Westfallen	-0.337
257	Neunkirchen	Saarland	Saarland	-0.338
258	Hameln-Pyrmont	Hannover	Niedersachsen	-0.357
259	Lörrach	Freiburg	Baden-Württemberg	-0.373
260	Weimarer Land	Thüringen	Thüringen	-0.374
261	Barnim	Brandenburg	Brandenburg	-0.377
262	Warendorf	Münster	Nordrhein-Westfallen	-0.378
263	Limburg-Weilburg	Gießen	Hessen	-0.381
264	Nürnberger Land	Mittelfranken	Bayern	-0.386
265	Ostholstein	Schleswig-Holstein	Schleswig-Holstein	-0.429
266	Mecklenburg-Strelitz	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.430
267	Kaiserslautern	Rheinhessen-Pfalz	Rheinland-Pfalz	-0.431
268	Schaumburg	Hannover	Niedersachsen	-0.435
269	Alb-Donau	Tübingen	Baden-Württemberg	-0.442
270	Neu Ulm	Schwaben	Bayern	-0.445
271	Fürth	Mittelfranken	Bayern	-0.457
272	Bad Kreuznach	Koblenz	Rheinland-Pfalz	-0.460
273	Ostallgäu	Schwaben	Bayern	-0.465
274	Krefeld	Düsseldorf	Nordrhein-Westfallen	-0.473
275	Pinneberg	Schleswig-Holstein	Schleswig-Holstein	-0.487
276	Regen	Niederbayern	Bayern	-0.493
277	Rhein-Kreis	Düsseldorf	Nordrhein-Westfallen	-0.493
278	Neustadt a.d. Aisch Bad Windsheim	Mittelfranken	Bayern	-0.495
279	Göttingen	Braunschweig	Niedersachsen	-0.504
280	St. Wendel	Saarland	Saarland	-0.509
281	Göppingen	Stuttgart	Baden-Württemberg	-0.514
282	Grafschaft Bentheim	Weser-Ems	Niedersachsen	-0.519
		30th Percentile		
283	Augsburg	Schwaben	Bayern	-0.520
284	Tübingen	Tübingen	Baden-Württemberg	-0.526
285	Hochtaunuskreis	Darmstadt	Hessen	-0.526
286	Osterode am Harz	Braunschweig	Niedersachsen	-0.529
287	Roth	Mittelfranken	Bayern	-0.539
288	Passau	Niederbayern	Bayern	-0.549
289	Werra-Meißner	Kassel	Hessen	-0.560
290	Verden	Lüneburg	Niedersachsen	-0.562
291	Straubing-Bogen	Niederbayern	Bayern	-0.574
292	Aschaffenburg	Unterfranken	Bayern	-0.586
293	Celle	Lüneburg	Niedersachsen	-0.590
294	Steinfurt	Münster	Nordrhein-Westfallen	-0.591
295	Waldshut	Freiburg	Baden-Württemberg	-0.595

296	Pirmasens	Rheinhessen-Pfalz	Rheinland-Pfalz	-0.596
297	Gelsenkirchen	Münster	Nordrhein-Westfallen	-0.621
298	Eichstätt	Oberbayern	Bayern	-0.633
299	Goslar	Braunschweig	Niedersachsen	-0.636
300	Dortmund	Arnsberg	Nordrhein-Westfallen	-0.678
301	Diepholz	Hannover	Niedersachsen	-0.679
302	Emmendingen	Freiburg	Baden-Württemberg	-0.683
303	Erding	Oberbayern	Bayern	-0.705
304	Lindau	Schwaben	Bayern	-0.716
305	Stade	Lüneburg	Niedersachsen	-0.718
306	Stormarn	Schleswig-Holstein	Schleswig-Holstein	-0.726
307	Bad Tölz-Wolfratshausen	Oberbayern	Bayern	-0.726
308	Ostvorpommern	Mecklenburg-Vorpommern	Mecklenburg-Vorpommern	-0.734
309	Osnabrück	Weser-Ems	Niedersachsen	-0.736
310	Odenwaldkreis	Darmstadt	Hessen	-0.740
311	Ammerland	Weser-Ems	Niedersachsen	-0.765
312	Rhein-Neckar	Karlsruhe	Baden-Württemberg	-0.766
313	Lippe	Detmold	Nordrhein-Westfallen	-0.770
314	Neuwied	Koblenz	Rheinland-Pfalz	-0.772
315	Rosenheim	Oberbayern	Bayern	-0.774
316	Main-Kinzig	Darmstadt	Hessen	-0.775
317	Rhein-Lahn	Koblenz	Rheinland-Pfalz	-0.775
318	Altenkirchen-Westerwald	Koblenz	Rheinland-Pfalz	-0.790
319	Rems-Murr-Kreis	Stuttgart	Baden-Württemberg	-0.793
320	Friesland	Weser-Ems	Niedersachsen	-0.808
321	Mayen-Koblenz	Koblenz	Rheinland-Pfalz	-0.812
322	Amberg-Sulzbach	Oberpfalz	Bayern	-0.835
323	Enzkreis	Karlsruhe	Baden-Württemberg	-0.848
324	Delmenhorst	Weser-Ems	Niedersachsen	-0.859
325	Wesermarsch	Weser-Ems	Niedersachsen	-0.885
		20th Percentile		
326	Bamberg	Oberfranken	Bayern	-0.891
327	Bergstraße	Darmstadt	Hessen	-0.902
328	Oberbergischer	Köln	Nordrhein-Westfallen	-0.930
329	Aachen	Köln	Nordrhein-Westfallen	-0.931
330	Calw	Karlsruhe	Baden-Württemberg	-0.975
331	Essen	Düsseldorf	Nordrhein-Westfallen	-0.989
332	Ahrweiler	Koblenz	Rheinland-Pfalz	-0.999
333	Offenbach	Darmstadt	Hessen	-1.034
334	Erlangen-Höchstadt	Mittelfranken	Bayern	-1.044
335	Rhein-Erft	Köln	Nordrhein-Westfallen	-1.047
336	Vogelsbergkreis	Gießen	Hessen	-1.049
337	Mainz-Bingen	Rheinhessen-Pfalz	Rheinland-Pfalz	-1.071
338	Worms	Rheinhessen-Pfalz	Rheinland-Pfalz	-1.102
339	Miesbach	Oberbayern	Bayern	-1.105

340	Bochum	Arnsberg	Nordrhein-Westfallen	-1.123
341	Würzburg	Unterfranken	Bayern	-1.140
342	Aichach-Friedberg	Schwaben	Bayern	-1.171
343	Euskirchen	Köln	Nordrhein-Westfallen	-1.175
344	Mettmann	Düsseldorf	Nordrhein-Westfallen	-1.175
345	Oldenburg	Weser-Ems	Niedersachsen	-1.196
346	Viersen	Düsseldorf	Nordrhein-Westfallen	-1.197
347	Wetteraukreis	Darmstadt	Hessen	-1.201
348	Duisburg	Düsseldorf	Nordrhein-Westfallen	-1.226
349	Hamm	Arnsberg	Nordrhein-Westfallen	-1.240
350	Herzogtum Lauenburg	Schleswig-Holstein	Schleswig-Holstein	-1.245
351	Garmisch-Partenkirchen	Oberbayern	Bayern	-1.260
352	Northeim	Braunschweig	Niedersachsen	-1.272
353	Düren	Köln	Nordrhein-Westfallen	-1.279
354	Südliche Weinstraße	Rheinhessen-Pfalz	Rheinland-Pfalz	-1.350
355	Breisgau-Hochschwarzwald	Freiburg	Baden-Württemberg	-1.362
356	Havelland	Brandenburg	Brandenburg	-1.451
357	Oberallgäu	Schwaben	Bayern	-1.453
358	Kassel	Kassel	Hessen	-1.478
359	Hildesheim	Hannover	Niedersachsen	-1.481
360	Mülheim an der Ruhr	Düsseldorf	Nordrhein-Westfallen	-1.543
361	Lüneburg	Lüneburg	Niedersachsen	-1.559
362	Wuppertal	Düsseldorf	Nordrhein-Westfallen	-1.559
363	Uelzen	Lüneburg	Niedersachsen	-1.560
364	Hagen	Arnsberg	Nordrhein-Westfallen	-1.562
365	Darmstadt-Dieburg	Darmstadt	Hessen	-1.613
366	Aurich	Weser-Ems	Niedersachsen	-1.651
367	Unna	Arnsberg	Nordrhein-Westfallen	-1.664
		10th Percentile		
368	Heinsberg	Köln	Nordrhein-Westfallen	-1.705
369	Ebersberg	Oberbayern	Bayern	-1.711
370	Remscheid	Düsseldorf	Nordrhein-Westfallen	-1.740
371	Dachau	Oberbayern	Bayern	-1.751
372	Schweinfurt	Unterfranken	Bayern	-1.758
373	Plön	Schleswig-Holstein	Schleswig-Holstein	-1.833
374	Bayreuth	Oberfranken	Bayern	-1.869
375	Alzey-Worms	Rheinhessen-Pfalz	Rheinland-Pfalz	-1.901
376	Forchheim	Oberfranken	Bayern	-1.905
377	Donnersbergkreis	Rheinhessen-Pfalz	Rheinland-Pfalz	-1.918
378	Trier-Saarburg	Trier	Rheinland-Pfalz	-1.933
379	Prignitz	Brandenburg	Brandenburg	-1.970
380	Ennepe-Ruhr	Arnsberg	Nordrhein-Westfallen	-2.010
381	Herne	Arnsberg	Nordrhein-Westfallen	-2.067
382	Regensburg	Oberpfalz	Bayern	-2.080
383	Bottrop	Münster	Nordrhein-Westfallen	-2.148

384	Fürth	Mittelfranken	Bayern	-2.162
385	Wesel	Düsseldorf	Nordrhein-Westfallen	-2.165
386	Fürstenfeldbruck	Oberbayern	Bayern	-2.170
387	Mönchengladbach	Düsseldorf	Nordrhein-Westfallen	-2.207
388	Helmstedt	Braunschweig	Niedersachsen	-2.262
389	Rhein-Sieg	Köln	Nordrhein-Westfallen	-2.480
390	Solingen	Düsseldorf	Nordrhein-Westfallen	-2.640
391	Rheinisch-Bergischer	Köln	Nordrhein-Westfallen	-2.652
392	Bad Dürkheim	Rheinhessen-Pfalz	Rheinland-Pfalz	-2.710
393	Südwestpfalz	Rheinhessen-Pfalz	Rheinland-Pfalz	-2.731
394	Lüchow-Dannenberg	Lüneburg	Niedersachsen	-2.808
395	Aachen	Köln	Nordrhein-Westfallen	-2.902
396	Kusel	Rheinhessen-Pfalz	Rheinland-Pfalz	-2.919
397	Gifhorn	Braunschweig	Niedersachsen	-2.939
398	Harburg	Lüneburg	Niedersachsen	-3.065
399	Rheingau-Taunus	Darmstadt	Hessen	-3.235
400	Wolfenbüttel	Braunschweig	Niedersachsen	-3.375
401	Cuxhaven	Lüneburg	Niedersachsen	-3.412
402	Ostprignitz-Ruppin	Brandenburg	Brandenburg	-3.481
403	Kaiserslautern	Rheinhessen-Pfalz	Rheinland-Pfalz	-3.572
404	Recklinghausen	Münster	Nordrhein-Westfallen	-3.960
405	Osterholz	Lüneburg	Niedersachsen	-4.107
406	Rhein-Pfalz	Rheinhessen-Pfalz	Rheinland-Pfalz	-4.297
407	Oberhausen	Düsseldorf	Nordrhein-Westfallen	-4.647