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Identifying macroeconomic effects of refugee migration to Germany

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Abstract

The underlying note investigates migration impacts on the German economy, explicitly distinguishing between refugee and non-refugee immigration. For this purpose, we propose a macroeconometric modelling approach complemented by instrumental variables. We find that refugee migration causes positive short-run reactions that would typically be connected to the demand side of the economy. However, it exerts negative effects on GDP and the labour market in the medium run. In contrast, non-refugee immigration turns out to have more beneficial medium-run effects.

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1. Introduction

The recent years have witnessed a strong upsurge of migration in Europe. The role of the major destination country fell to Germany, where immigration due to the European economic crisis was added by refugees mainly from the Middle East. In view of intensifying migration, the discussion on economic consequences has gained momentum all throughout Europe. However, still little is known about the macroeconomic effects of refugee migration. Particularly, refugees naturally differ from other migrants in aspects such as strong push factors (Ruist 2013), no sorting with regard to labour market needs of the host country, specific institutional regulations, need of immediate support and special prospects for the duration of stay (Cortes 2004).

Against this backdrop, the underlying note investigates migration impacts on the German economy, distinguishing between refugee immigration (RI) and non-refugee immigration (NRI). We consider migration effects on the major macroeconomic aggregates given by gross domestic product (GDP), unemployment and wages. Our study contributes to the macroeconometric modelling of migration effects (e.g. Furlanetto and Robstad 2016; Kiguchi and Mountford 2017) by constructing a structural vector autoregressive (SVAR) model for analysing the economic influences of migration. In such a framework, appropriate identification of structural shocks is key. We address this point by introducing an instrumental variables (IV) identification of shocks into a SVAR setting (compare Stock and Watson 2012).

Our measurement approach very generally maps comprehensive macroeconomic effects and interactions of migration shocks. Estimation is performed by frequentist shrinkage techniques, which enables an investigation of rather complex model structures given a relatively limited number of observations. Data requirements are low, whereas broad micro data on RI to Germany are not available. Importantly, the approach is based on a minimal set of identifying assumptions, as it is the nature of the SVAR methodology. Inference does not rely on a priori specification of specific structures, e.g., regarding wage behaviour or complementarity relations. In sum, comprehensive linkages can be determined without making far-reaching assumptions on how they are realised in the economy.

On the downside, interpretations following from our approach can be less clearly guided by explicit mechanisms. Put differently, the model does not restrict itself to specific impact channels. Considering these differences as well as pros and cons, our study can be seen as complementing other approaches from the migration literature, which use structural equilibrium modelling or regional variation (e.g. Borjas 2003; for Germany Pischke and Velling 1997; D'Amuri et al. 2010; Brücker et al. 2014).

The next section introduces our data, followed by a description of the model and the identification methods. Section 4 discusses the resulting impulse responses and the last section concludes.

2. Data

We employ yearly German data 1970-2014. We focus on gross immigration since recorded outflows are subject to substantial measurement errors and not available by refugee status. The general migration statistics contain no reason for immigration, such as seeking a job a being a refugee. However, the Federal Office for Migration and Refugees provides data on the number of asylum applications. We use these data as a proxy for RI. While every asylum seeker has to make such an application, a potential weakness of the proxy lies in the fact that the immigration and the application do not necessarily fall within the same year. Substantial delays occurred in 2015 when administrative processes could not keep up with the refugee wave. However, apart from this exceptional situation, immigration is usually closely followed by an asylum application so that the share of misclassifications would be very low (and rather irrelevant since immigration in late December and early January is largely equivalent). Moreover, a relevant share of refugee immigrants continue their journey to third countries. In contrast, an asylum application in Germany more likely signals a relevant duration of stay, which represents an advantage of our RI proxy. NRI is given by the overall gross immigration from destatis (which explicitly contains asylum-seekers) minus RI (Figure 1).

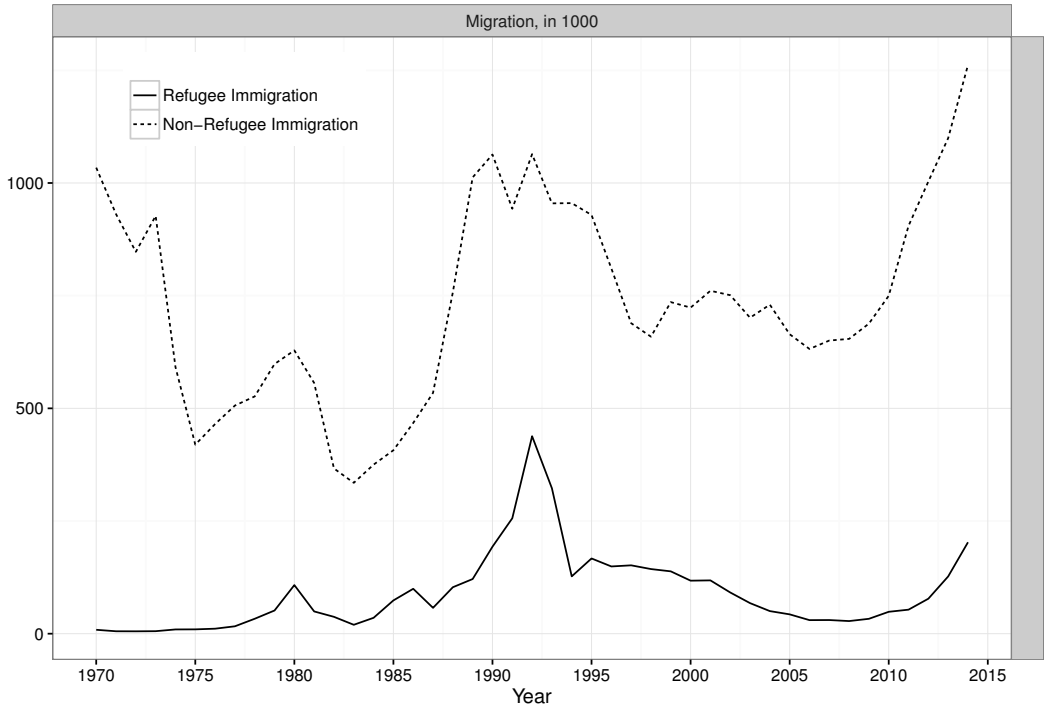
While the decline of immigration during the 1970s and 1980s following the oil price shocks was due to tightening migration restrictions, the increase in the 1990s resulted from the collapse of the Eastern European communist regimes and the civil wars in Yugoslavia for RI. Then, immigration slowed down due to economic slack and tighter restrictions, before the current migration wave started with the European economic and the refugee crisis. As regards refugee immigration, Germany received a steadily increasing share of European immigrants in the last 10 years. There seems to be low country-specific volatility as compared to other EU-countries[1].

The variables representing the macroeconomy are log real GDP, the wages share (gross wages divided by GDP) and the unemployment rate, all from destatis. GDP is divided by working-age population. RI and NRI are per capita of total population. All variables are multiplied by 100. The West-German pre-unification series of GDP, wages and population are proportionally adjusted to match the overlapping German figure of 1991.

While migration can impact the macroeconomy in the host country, it may also be

[1]See http://ec.europa.eu/eurostat/web/asylum-and-managed-migration/overview.

Figure 1: Refugee immigration and non-refugee immigration to Germany.



Sources: Federal Office for Migration and Refugees, destatis.

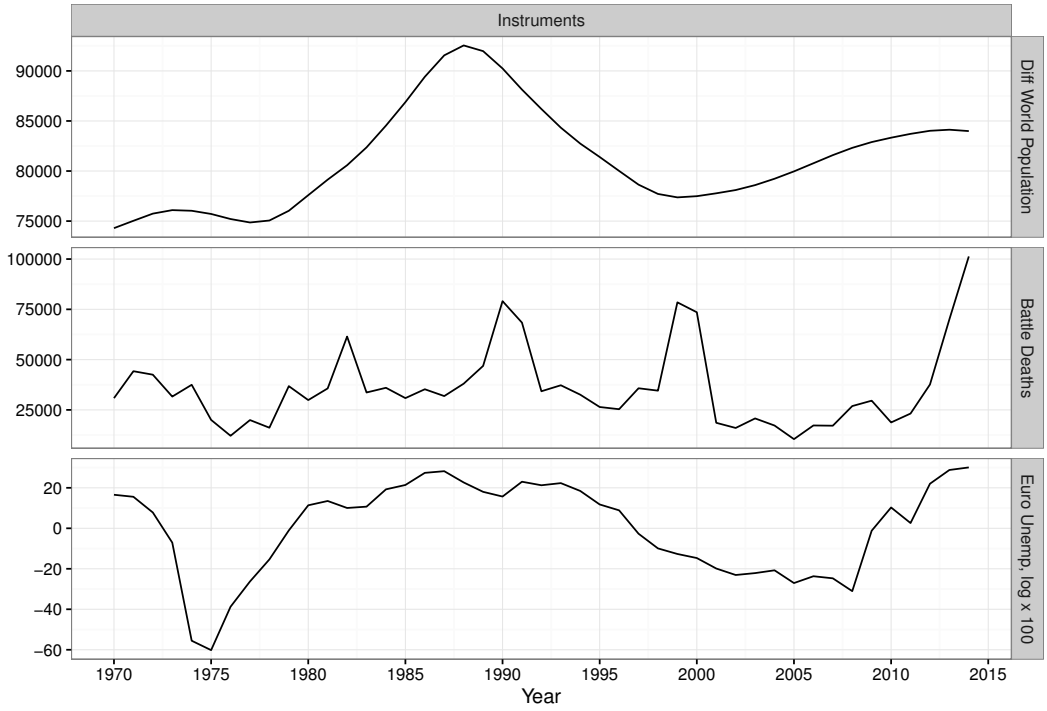
endogenous in the sense that it reacts to economic pull factors from this country. Due to this potential endogeneity, we instrument migration by push factors. World (less German) population from the UN World Population Prospects serves as a general instrument (Figure 2). As an instrument specifically for RI, we use the UCDP Battle-related Deaths Dataset, Version 5.0-2015[2] that provides the number of deaths resulting directly from violence in armed conflicts with at least one national government involved. While direct effects of this variable on the German macroeconomy are imaginable, they can be considered of minor importance compared to the (instrumented) channel through refugee migration, also in view of the fact that the conflicts usually concerned countries of low economic significance. The standard migration literature (compare Hatton 1995) sees labour market conditions as a typical determinant. We instrument NRI by unemployment in Europe[3], which is filtered by an orthogonal projection on the German unemployment rate. This accounts for international cyclical linkages that would invalidate the instrument.

Auxiliary regressions of RI and NRI on the three instruments (and autoregressive lag, constant, linear trend) delivered F-statistics for the IVs of 13.5 and 9.3, respectively,

[2]See http://www.pcr.uu.se/research/ucdp/datasets/ucdp_battle-related_deaths_dataset/. The dataset is extended back to 1970 using the PRIO dataset, version 3; see Lacina and Gleditsch (2005). Conflicts in America are dropped due to low relevance for German immigration.

[3]We aggregated registered unemployment figures from the ILO database of those (18) countries with data availability since the 1970s.

Figure 2: Instruments: change in world population, battle-related deaths (without America), European unemployment (corrected for German unemployment).



Sources: UN World Population Prospects, UCDP Battle-related Deaths Dataset, ILO, own calculations.
Notes: Annual changes in world population in 1000 persons, European unemployment in natural logarithms, multiplied by 100.

where battle deaths lagged two periods provided the best fit. The estimation is robust against lagging world population, which could be justified in view of newborn aging. Battle deaths were only significant for RI, while unemployment only affected NRI. Thus, separate instruments of sufficient strength are available.

3. Model and Identification

We proceed in a SVAR framework that allows modelling structural shocks and dynamic interactions. The vector y contains RI, NRI as well as GDP, wage share and unemployment rate. x holds the instruments (that are included in the style of classical simultaneous systems), compare Stock and Watson (2012).

$$Ay_t = C_1 + C_2 t + \sum_{i=1}^{p} B_i y_{t-i} + Dx_t + \varepsilon_t \tag{1}$$

The matrix A (with normalised diagonal elements) contains the mutual contemporaneous spillovers, the dynamic interaction is covered by the lag coefficients in B_i, $i = 1, \ldots, p$. D

holds the coefficients of the instruments in the first rows and zeros else. C_1 and C_2 are the deterministics coefficient vectors, ε includes the shocks. Moreover, we consider impulse dummies in the GDP equation for the extreme observation in 2009 and the reunification in 1991.

Residual correlograms and information criteria showed that $p = 3$ lags are sufficient to capture the system dynamics. Unit root tests do not provide clear evidence on the persistence of the series. While with Augmented Dickey Fuller tests with trends and appropriately chosen lag length, a unit root is rejected only for the wage share, the Zivot and Andrews test which allows for trend and level breaks rejects the null of unit roots for GDP, wage share and unemployment rate at a 5% level. To reflect this ambiguity, all endogenous variables are included in levels. In a VAR with sufficient lag length, this allows for flexible formation of quasi differences or level relations under both the unit root and the (trend) stationary scenario. Instruments are included in first differences which yields a reasonable fit without inflating the parameter space through lagged instruments.

Migration is instrumented by IVs exerting direct effects exclusively on RI (except European unemployment) and NRI (except battle deaths). This identifies the migration shocks and all bidirectional contemporaneous spillovers in A between the migration and macroeconomic variables without further restrictions (such as a conventional Cholesky structure). However, for a priori reasons, we exclude contemporaneous effects of the macroeconomic variables on RI, which also would be insignificant (p-value of a LR-test 0.988).

Common factors in RI and NRI would distort the estimates of the direct spillovers. However, since both variables are separately instrumented, in addition to bilateral contemporaneous impacts we can allow for correlation of their shocks as in typical simultaneous systems. Furthermore, the innovations within the block of the macroeconomic variables are allowed to be correlated, since our research question does not require identification here.

Our VAR model is rather richly parameterized, especially considering the limited number of observations available for such analyses. Therefore, to reduce the estimation variance, we employ a multivariate ridge regression approach. The regularization parameter is estimated by 10-fold blockwise cross validation. Coefficients on deterministic terms and instruments are exempt from shrinkage, just as coefficients on y_{t-1}, in order to prevent unnecessarily strong restrictions on the persistence of the series. Analogously to Bayesian VAR estimation in the spirit of Litterman (1986), a factor j^2 on the shrinkage parameter of y_{t-j} penalizes higher lag coefficients more heavily. Based on the reduced form, the simultaneous coefficients in A and D as well as the residual covariance matrix are estimated in a second step by maximising the penalized likelihood function. The

coefficients in A are shrunk with the penalization parameter from the first step. Confidence bands for impulse responses are constructed using a residual-based moving block bootstrap as described by Brüggemann et al. (2016) with block length 3. The shrinkage parameter is re-estimated in each draw. The standard percentile method obtains 2/3 pointwise confidence intervals.

4. Results

Figure 3 shows impulse responses (and confidence bands) to structural RI shocks. In the medium run RI shocks have adverse effects on the unemployment rate and also on per capita GDP and the wage share. This is likely to be explained by limited formal qualification and transferability of human capital and a rather poor fit of refugees to the needs in the German labour market. It would represent a labour supply shock concentrated in segments with typically low wage flexibility and rather high unemployment risks (cf. Brücker et al. 2014).

In the longer run, the adverse effects decrease. This could be connected to further qualification and integration of the immigrants and adjustment of the capital stock that remains rather fixed in the short run – e.g. Ottaviano and Peri (2012). Still, an elevated unemployment rate can remain since the composition of the work force changes. For interpreting the relatively strong longer-run unemployment reaction, the sizeable cumulated impulse response of RI must be taken into account – which amounts to 3.7 percent of the total population until horizon 15.

The short-run responses are relatively imprecisely measured. However, we note that at least no adverse effects can be verified. While this would seem counter-intuitive in light of the arguments above, it is important to note that in the short run, demand-side effects can play a role in the macroeconomy. Indeed, RI increases aggregate demand for several reasons. It requires immediate investments, e.g. for appropriate housing, and additional personnel in administration, education or social work. By the same token, social assistance payments have an expansive effect. Moreover, these expenses usually go along with high multipliers. A second reason for the absence of adverse short-run effects lies in the sequence of RI: Partly due to legal regulations, asylum seekers become relevant for the labour market only with delay. Therefore, initially no pressure on wages and unemployment is created.

Figure 4 depicts the impulse responses to NRI shocks. Here, in contrast to the case of RI, the unemployment rate shows no clear reaction. By the same token, the wage share and per capita GDP remain rather constant. Notably, this concerns the reactions of a per-capita value, a share and a rate. Logically, the absolute volume of the economy

is increased by NRI (since the number of persons increases and per-capita values stay constant). This happens according to the average performance of the overall labour force.[4]

These results are in line with NRI being in total more labour-market-oriented and higher skilled than RI. Of course, low-skilled immigration to Germany is not restricted to refugees. However, the overall qualification structure of NRI is better, such that average effects measured are more beneficial. Given a better fit of qualifications, it is more likely that an immigration surplus and gains from complementarities can be realised. Moreover, domestic lower-skilled labour market segments could benefit from increasing labour supply in higher-skilled segments. The fact that per capita GDP tends to increase while the wage share stays constant suggests that employers are able to realise certain gains from immigration. In general, based on the separation of RI and NRI, our results favour the view that immigration (at least NRI) has no adverse effects on the German economy (e.g. Felbermayr et al. 2010).

While the long sample period facilitates analysing migration effects within our methodological framework, naturally, migration conditions and characteristics were not constant through the decades. However, the CUSUM test of Ploberger and Krämer (1992), based on structural residuals $\hat{\epsilon}_t$, found no evidence for structural breaks in the model parameters (available upon request). This strengthens our confidence that we can draw valid conclusions from our estimations.

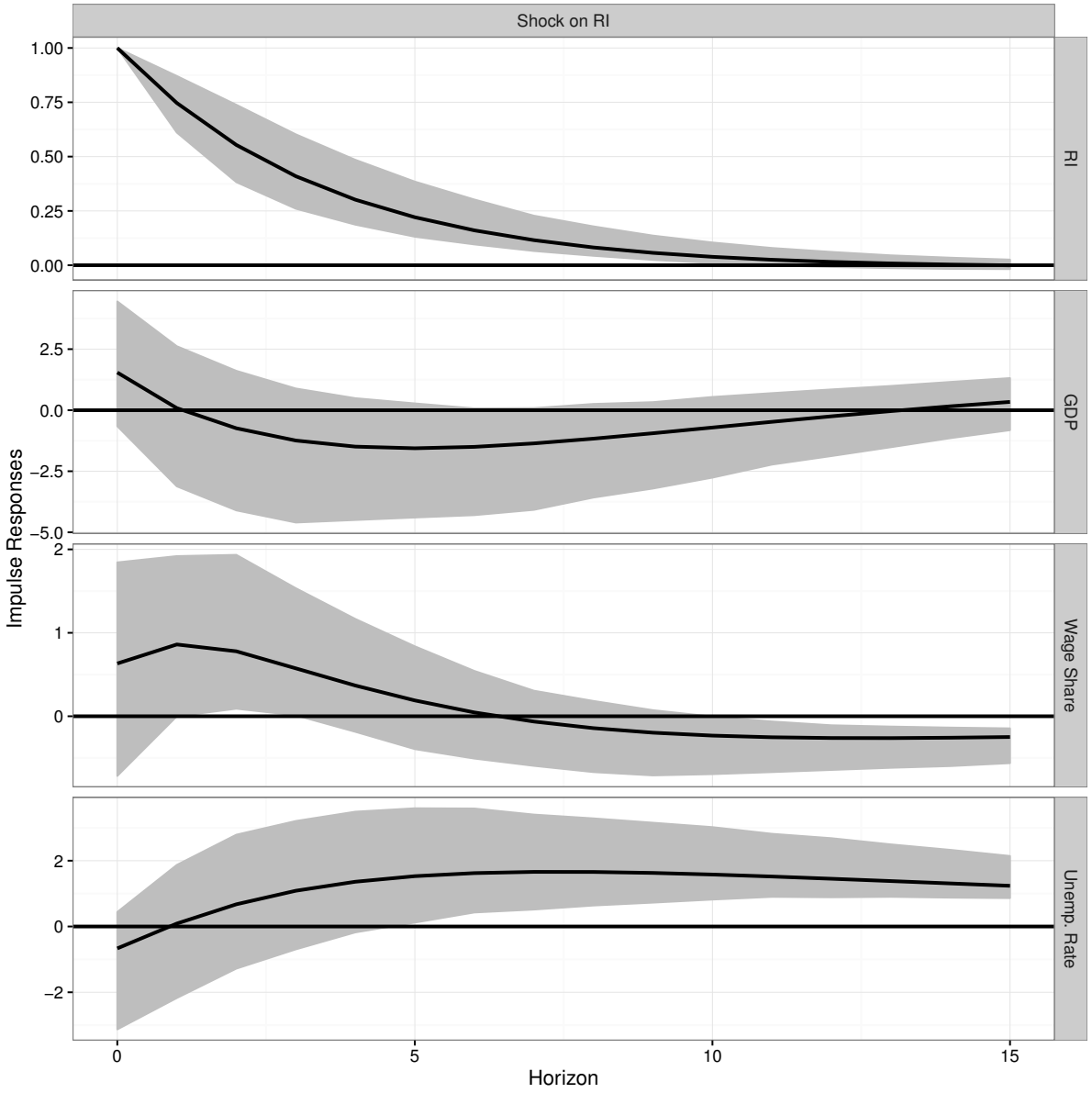
5. Conclusion

We analyse migration effects in a macroeconometric model setting, explicitly distinguishing between RI and NRI. NRI has more beneficial medium-run effects, favouring the view that immigration (NRI) has no adverse effects on the German economy (e.g. Felbermayr et al. 2010). A RI shock first causes positive (demand-side) reactions, but then lowers per capita GDP and the wage share while increasing the unemployment rate. Nonetheless, these effects recede over time.

Implications for the recent peak of RI are twofold. On the one hand, there are clear risks that economic conditions are adversely affected. However, on the other hand, the results for NRI show that immigration to Germany in general is not accompanied by negative effects. Therefore, if efforts regarding integration, language skills, qualification, use of informal competencies and labour market access succeed, economic outcomes can be expected to improve visibly. Such a strategy requires significant initial investments (compare Bach et al. 2017).

[4] If GDP is not taken per capita, its impulse response is significantly positive.

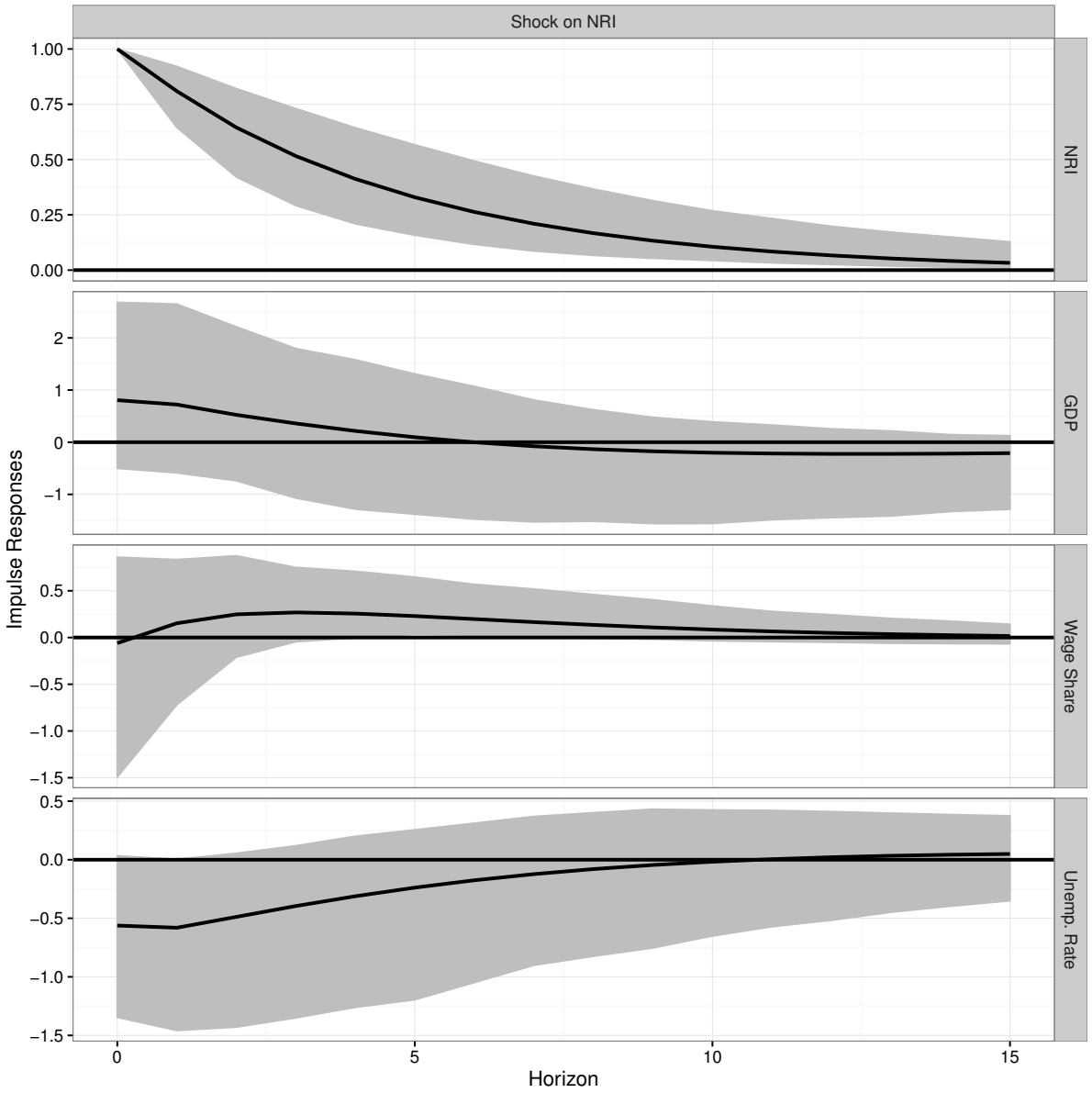
Figure 3: Responses to RI shocks.



Source: Own calculations.

Notes: Migration flows in percent of total population, GDP effects in percentage changes of per capita real GDP, wage share and unemployment rate in percentage points.

Figure 4: Responses to NRI shocks.



Source: Own calculations.

Notes see Figure 3.

References

Bach, S., Brücker, H., Haan, P., Romiti, A., Deuverden, K. v. and Weber, E. (2017) "Refugee integration: a worthwhile investment" *DIW Economic Bulletin* **7**, 33–43.

Borjas, G. (2003) "The labor demand curve is downward sloping: re-examining the impact of immigration on the labor market" *Quarterly Journal of Economics* **118**, 1335–1374.

Brücker, H., Hauptmann, A., Jahn, E. J. and Upward, R. (2014) "Migration and imperfect labor markets: Theory and cross-country evidence from Denmark, Germany and the UK" *European Economic Review* **66**, 205–225.

Brüggemann, R., Jentsch, C. and Trenkler, C. (2016) "Inference in VARs with conditional heteroskedasticity of unknown form" *Journal of Econometrics* **191**, 69–85.

Cortes, K. E. (2004) Are refugees different from economic immigrants? some empirical evidence on the heterogeneity of immigrant groups in the United States" *Review of Economics and Statistics* **86**, 465–480.

D'Amuri, F., Ottaviano, G. and Peri, G. (2010) "The labor market impact of immigration in Western Germany in the 1990s" *European Economic Review* **54**, 550–570.

Felbermayr, G., Geis, W. and Kohler, W. (2010) "Restrictive immigration policy in Germany: pains and gains foregone?" *Review of World Economics* **146**, 1–21.

Furlanetto, F. and Robstad, Ø. (2016) "Immigration and the macroeconomy: some new empirical evidence" Norges bank working paper number 2016/18

Hatton, T. (1995) "A model of UK emigration, 1870-1913" *Review of Economics and Statistics* **77**, 407–415.

Kiguchi, T. and Mountford, A. (2017) "Immigration and unemployment: A macroeconomic approach" *Macroeconomic Dynamics*, forthcoming.

Lacina, B. and Gleditsch, N. (2005) "Monitoring trends in global combat: A new dataset of battle deaths, *European Journal of Population* **21**, 145–166.

Litterman, R. B. (1986) "Forecasting with Bayesian vector autoregressions - five years of experience" *Journal of Business & Economic Statistics* **4**, 25–38.

Ottaviano, G. and Peri, G. (2012) "Rethinking the effects of immigration on wages" *Journal of the European Economic Association* **10**: 152–197.

Pischke, J.-S. and Velling, J. (1997) "Employment effects of immigration to Germany: An analysis based on local labor markets" *Review of Economics and Statistics* **79**, 594–604.

Ploberger, W. and Krämer, W. (1992) "The CUSUM test with OLS residuals" *Econometrica* **60**, 271–285.

Ruist, J. (2013) "The labor market impact of refugee immigration in Sweden 1999-2007" SULCIS working paper number 1

Stock, J. H. and Watson, M. W. (2012) "Disentangling the channels of the 2007-09 recession" *Brookings Papers on Economic Activity: Spring 2012*, p. 81.