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Supplementary Materials for

The long-term impact of employment bans on the economic integration of refugees

Moritz Marbach, Jens Hainmueller*, Dominik Hangartner

*Corresponding author. Email: jhain@stanford.edu

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Section S1. Supplementary Materials and Methods

1.1 Background on Kosovo Refugee Crisis

The Kosovo War took place between 1998 and 1999. Before the war, the Kosovo region was part of the Federal Republic of Yugoslavia (FRY). In the mid 1990s, the Kosovo Liberation Army began an insurgency against the central government with a series of attacks against Serbian installations. In early 1998, the conflict escalated to a full-scale civil war, civilian casualties increased, and Kosovar Albanians and others fled from the Kosovo region. After a diplomatic solution failed, NATO launched a comprehensive air bombardment campaign on all Yugoslavian military installations in 1999, which led to more people fleeing from the region.

Data from the UNHCR suggests that most of those who fled from the Kosovo War sought asylum in Western European countries, and in particular in Germany. Table S1 shows the number of asylum applications from the FRY in Western Europe and Germany as well as the share of Kosovo Albanians, respectively. These numbers exclude applications that were refiled after an initial rejection. Note that the data for the share of Kosovo Albanians is based on self-reports by the asylum seekers and therefore might be affected by strategic misreporting of ethnicity. In addition, it appears that the ethnicity classification was revised in 1999, which might compromise the comparability across years.

Table S1. **Asylum applications from the FRY in Europe and Germany**. Table shows the number of initial asylum-application submissions in Europe and West Germany. The second-to-last column shows the share of applications filed in Germany, and the last column shows the share of applications filed by Kosovo Albanians in Germany. Source: (*1–4*)

	Asylum Applications from Federal Republic of Yugoslavia			
	Number of Applications		% of Applications	
Year	West Europe	Germany	Germany	Kosovo Albanians
1998	88,236	34,979	42%	88%
1999	119,060	31,450	28%	66%
2000	46,495	11,121	25%	34%
2001	29,497	7,758	28%	40%

Table S2 shows the number of asylum seekers arriving in Germany from the Federal Republic of Yugoslavia as measured by German registry data (*Ausländerzentralregister*). These data have been requested by the authors from the Federal Statistical Office of Germany via its public information service. Note that these numbers do not exactly match those from the UNHCR in table S1 since they refer to individuals and not to applications. We see that the large majority of persons from the Federal Republic of Yugoslavia who arrived during 1998 to 2001 were asylum seekers and refugees. An asylum seeker is an individual who filed an application for asylum. A refugee is an individual whose application for asylum has been successful and who receives some form of (temporary) protection.

Table S2. **Arrivals from the FRY in Germany**. Table shows the annual number of arrivals from the Federal Republic of Yugoslavia as well as the number of asylum seekers and refugees (based on the legal status (*Aufenthaltsstatus*) as of December 31 of the arrival year; asylum seekers and refugees are individuals who held a *Aufenthaltsgestattung* or a *Duldung*). Source: Ausländerzentralregister Deutschland, 2015.

Year	All Arrivals	Asylum seekers and Refugees	in %
1998	37,047	32,871	89
1999	48,506	40,501	83
2000	14,639	11,249	77
2001	10,640	6,421	60

1.2 Labor Market Access of Asylum Seekers in Germany

Before January 1, 2001, access to the German labor market was severely restricted for asylum seekers and refugees. Asylum seekers, refugees with subsidiary protection, and most refugees with temporary asylum had to apply for a job-specific work permit (*Allgemeine Arbeitserlaubnis*) with the German labor market agencies. By law a work permit could be granted only if no German with the same qualifications was available to fill the vacancy (*Vorrangprüfung*). The small group of refugees who were granted full asylum under the Geneva convention had full access to the labor market via a special work permit (*Besondere Arbeitserlaubnis*), but this is not relevant for our sample of FRY refugees who were not granted full asylum.

In May 1993, the Minister for Work, Norbert Blüm, issued a set of rules that stipulated that employers had to justify in great detail why they rejected an application by a German and instead preferred to hire a foreigner. In June 6, 1997 these rules were further tightened by the head of the labor market regulation unit in the Ministry for Work, Peter Clever, who instructed all local branches not to issue any work permits to asylum applicants or anyone eligible for temporary protection who arrived in Germany after May 15, 1997. Clever's directive came to be known as the *Clever Erlass* (*5*).

In March 22, 2000, a court effectively declared the *Clever Erlass* illegal (*Sozialgericht Lübeck, 2. Kammer, Az.: S 2 AL 8/99*), and the government issued a new legislative regulation in September 2000, the so-called *Riester Verordnung*, named after the new Minister of Labour and Social Affairs, Walter Riester. The *Riester Verordnung* came into effect on December 15, 2000 (*Erste Verordnung zur Änderung der Arbeitsgenehmigungsverordnung v. 08.12.2000, BGBl. I, S. 1684*). Under this new regulation asylum seekers could apply for a work permit 12 months after their arrival date, and those who had been granted asylum could enter the labor market immediately. Importantly, the new rule was retroactively applied to asylum seekers who had arrived before December 15, 2000 (*6, 7*).

Figure S1 illustrates the effect of the regulatory switch from the *Clever Erlass* to the *Riester Verordnung* on the mandatory waiting period as a function of the arrival months between 1999

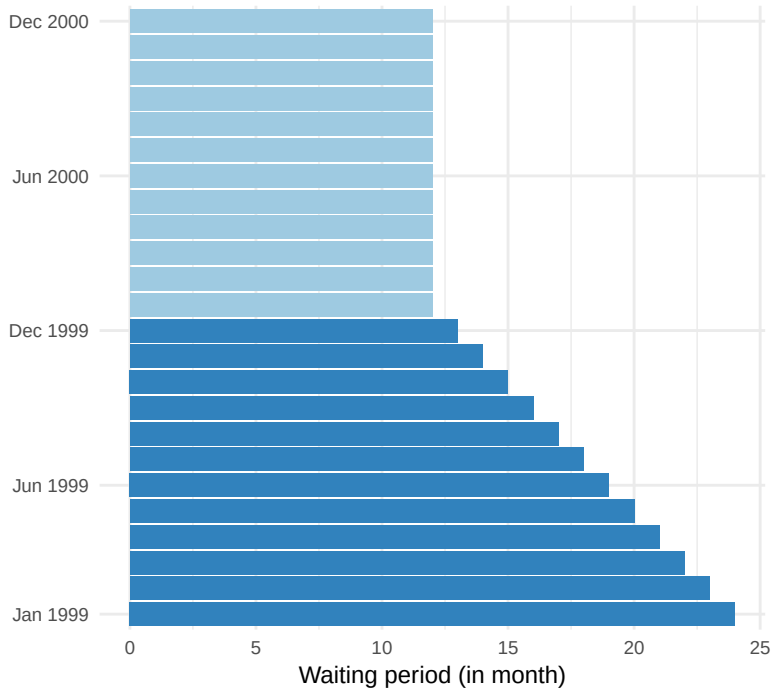

Fig. S1.Illustration of the waiting period as a function of the arrival month.

and 2000. As is evident in fig. S1, the asylum seekers who arrived in Germany in 1999 and 2000 faced very different wait times, because of the new, 12-month waiting period that went into effect on December 15, 2000. All those who entered in 2000 had to wait 12 months from their date of arrival before they were allowed to enter the German labor market. By contrast, those who entered in 1999 had to wait between 13 and 24 months, depending on when in 1999 they had arrived. For example, someone who had arrived in January 1999 had to wait 24 months while someone who had arrived in December 1999 only had to wait 13 months.

Based on monthly data about the number of asylum applications from the Federal Republic of Yugoslavia (*8, 9*), we estimated that the average waiting time for the 1999 arrival cohort was about 19 months, while it was 12 months for the 2000 arrival cohort. The average difference in the length of the waiting period between the 1999 and 2000 cohort was 7.1 months. Since there is a lag between the month of arrival and the month of applying for asylum (due to bureaucratic backlog), this estimate is approximate.

1.3 Variable Dictionary

Table S3. lists all the variables used in the analysis.

Table S3. List of variables.

Variable	Description
Cohort	Year of arrival ($1999 = 0, 2000 = 1$)
Length of residency	Survey year - year of arrival
Employed	1 if employed (*Erwerbstätiger*); 0 otherwise
Age	Age
Gender	Gender
Schooling	1 if at least lower tier education (*Hauptschulabschluss*); 0 otherwise

Section S2. Descriptive statistics

Table S4 shows the descriptive statistics for the main study sample and table S5 the descriptive statistics for the male study sample.

Table S4. Descriptive statistics for the main study sample ($n = 1645$).

Variable	Mean	SD
Cohort	0.37	0.48
Length of residency	8.80	4.09
Employed	0.49	0.50
Age	38.98	10.83
Gender	0.54	0.50
Schooling	0.76	0.43

Table S5. Descriptive statistics for the male study sample ($n = 749$).

Variable	Mean	SD
Cohort	0.38	0.49
Length of residency	8.89	4.10
Employed	0.66	0.47
Age	38.73	10.21
Schooling	0.82	0.38

Section S3. Further results

3.1 Balance Tests

Figure S2 reports covariate-by-covariate balance checks comparing the background characteristics of the 1999 and 2000 FRY refugee arrival cohorts. We find that the two cohorts are statistically indistinguishable on all background covariates. The only exception to this are some imbalances that occur in the first survey year in 2000. In this survey year, respondents arriving in 2000 tend to be younger and are less likely to have primary school education. This imbalance is most likely due to the fact that the 2000 arrival cohort is only partially covered in the 2000 Mikrozensus wave. This is because refugees were arriving throughout that year, but the field period for the 2000 Mikrozensus survey was only between May 8th, 2000 and May 14th, 2000. Therefore the 2000 Mikrozensus missed all of the refugees who arrived after May 14, 2000. In contrast, by 2001, all refugees of the 2000 cohort had arrived and were likely included in the target population of the Mikrozensus and accordingly the balance in the covariates is restored when we compare the 1999 and 2000 arrival cohorts in the 2001 survey and all following survey waves.

The implication of this incomplete coverage in 2000 for the 2000 arrival cohort is that for this particular survey year, the comparison might well be confounded, but this issue should not affect our inference for the following survey years which are the core focus of our study. In fact, all analyses except Figure 1 (the raw means) and the balance checks exclude the survey year 2000 given that our inferences about the effects of the employment ban focus on the post-2000 period.

In addition, we checked whether the cohorts differ in terms of reported health problems. Across all survey waves, none of the 2000 arrivals reported severe health problems, and of the 1999 arrivals only six respondents (1%) reported severe health problems.

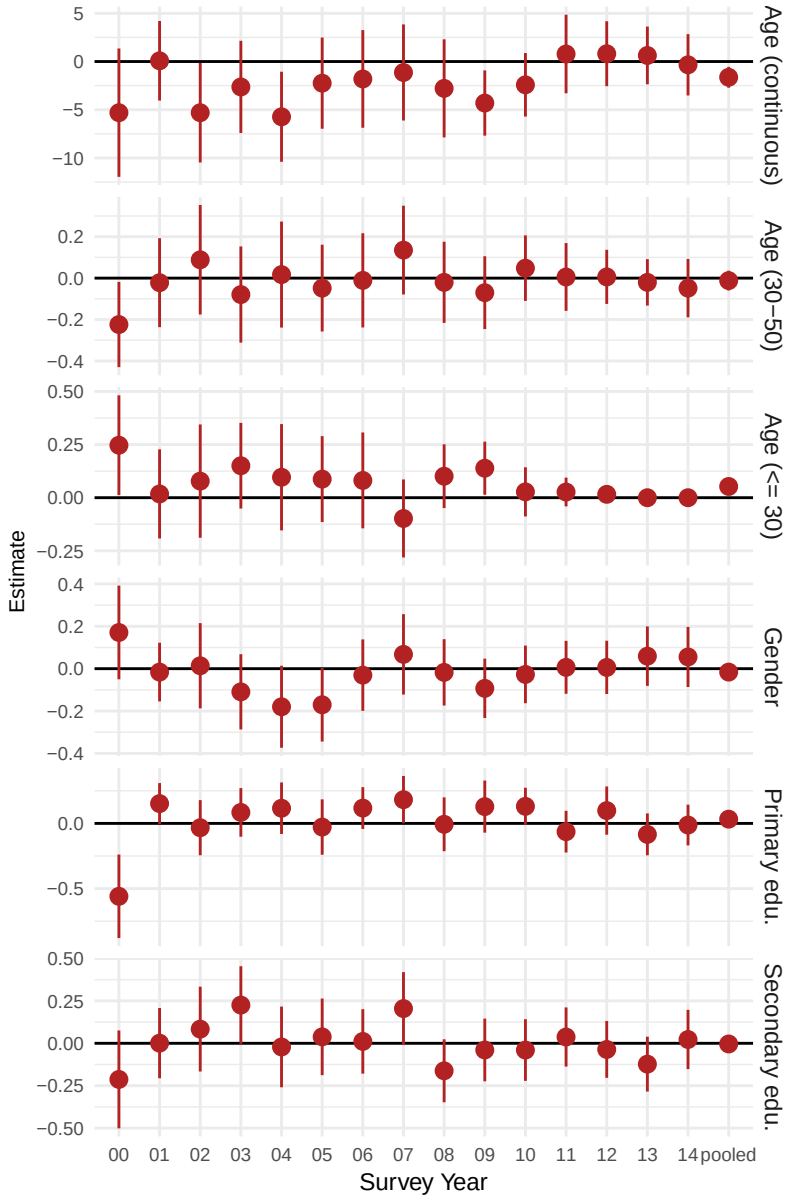

Fig. S2. **Balance checks for 1999 versus 2000 FRY arrival cohort**. Each panel shows the difference-in-means estimate for a specific covariate with a 95% confidence interval (based on standard errors clustered at the household) for each survey-year for the main study sample. The last estimate to the right is the difference-in-means estimate pooled across all survey waves estimated with a regression of the covariate on a cohort indicator and survey-year fixed-effects. Covariate definitions: `Age` is a continuous variable measuring the age of a respondent in a survey year, `Age (30−50)` indicates if a respondent is between 30-50 years old, `Age (<=30)` indicates if a respondent is at most 30 years old, `Primary edu.` indicates if a respondent has at least a lower tier eduction (*Haupt(Volks)schulabschluss*) and `Secondary edu` indicates if a respondent has at least a middle tier education (*Realschulabschluss*).

3.2 Attrition Check

Figure S3 examines the sampling probabilities for the 1999 and 2000 arrival cohorts in each survey wave by showing the fraction of the pooled sample that is from the 1999 arrival cohort. The sample composition remains fairly constant over time, which indicates that there are no discernible differences between the 1999 and the 2000 cohort in terms of the propensity to leave Germany. If one cohort were more likely to emigrate, the fraction of that cohort would be expected to decline over time, as the Mikrozensus is based on a representative sample of the resident population.

Note again that the exception to the pattern is the 2000 survey wave, where the 2000 arrival cohort has a relatively lower sampling rate due to the incomplete coverage of asylum seekers who arrived in 2000 but after the Mikrozensus fieldwork for that year had been completed.

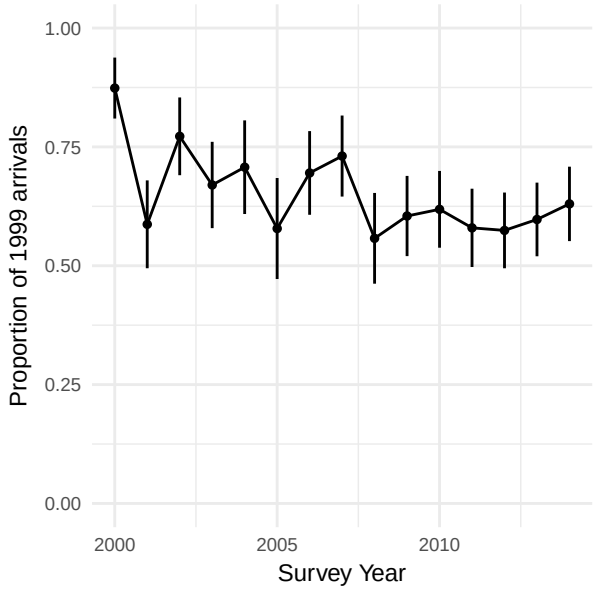

Fig. S3. **Sampling probabilities for arrival cohorts by year**. Shows the proportion of 1999 arrivals in the pooled 1999/2000 arrivals Mikrozensus sample in each survey year for respondents from the Federal Republic of Yugoslavia.

3.3 Effect Estimates from Linear Interaction and Binning Specification

Table S6 shows the effects of the longer employment ban on refugee employment based on the linear interaction specifications. These estimates correspond to the marginal effect line shown in Figure 1 in the main text. Table S7 shows the corresponding effects from the binning specification. These estimates correspond to the dots shown in Figure 1 in the main text.

Table S6. **Estimated difference in employment rates between 1999 and 2000 cohort by years of residency**. Shows the estimated marginal effects of the cohort indicator for various levels of length of residency based on the linear interaction specifications as described in equation 1 ($n = 1,645$).

Years of Residency	Marginal Effect	Standard Error
1	0.10	0.050
3	0.10	0.040
5	0.09	0.032
7	0.08	0.026
9	0.07	0.024
11	0.07	0.027
13	0.06	0.034
15	0.05	0.043

Table S7. **Estimated difference in employment rates between 1999 and 2000 cohort by years of residency (binning estimator)**. Shows the estimated marginal effects of the cohort indicator for three length of residencies based on the binning specifications as described in equation 2 ($n = 1,645$).

Years of Residency	Marginal Effect	Standard Error
4	0.15	0.045
9	-0.01	0.051
13	0.07	0.040

3.4 Effect of Employment Ban on Search Effort

Table S8 shows the effects of the employment ban on the search effort as measured by a question about whether unemployed respondents are reporting that they had actively searched for a job in the 3 weeks before the survey. We regress this indicator for active search on the cohort indicator plus survey-wave fixed effects and the baseline model covariates (gender, age, schooling).

We find that unemployed respondents from the 2000 cohort who faced a shorter waiting period had about a 7 to 9 percentage point higher probability of having searched for a job, according to the pooled estimates. The estimates broken down by two-year intervals are more noisy and generally positive but insignificant. The sample sizes are also smaller since the models are only fitted to unemployed respondents.

Table S8. **Effect of employment ban on search effort**. Shows coefficients and household-clustered standard error in parentheses. The outcome variable is an indicator for whether unemployed respondents are reporting that they actively searched for a job in the 3 weeks before the survey. Covariates include gender, age, and schooling.

	2001-03	2004-06	2007-09	2001-09	2001-09
Cohort	0.06	0.14	0.09	0.09	0.08
	(0.076)	(0.089)	(0.079)	(0.046)	(0.043)
Constant	0.23	0.14	0.18	0.22	0.74
	(0.058)	(0.055)	(0.067)	(0.056)	(0.106)
Survey FE	Yes	Yes	Yes	Yes	Yes
Covariates	No	No	No	No	Yes
N	222	149	173	544	544

3.5 Subsample Analysis: Male Respondents

Figure S4 shows the replication of Figure 3 in the main text for male respondents only. The results are fairly similar to the overall sample but less precisely estimated given the lower sample size. Table S9 shows the corresponding effect estimates from the linear interaction specification and Table S10 shows the corresponding effect estimates from the binning specification.

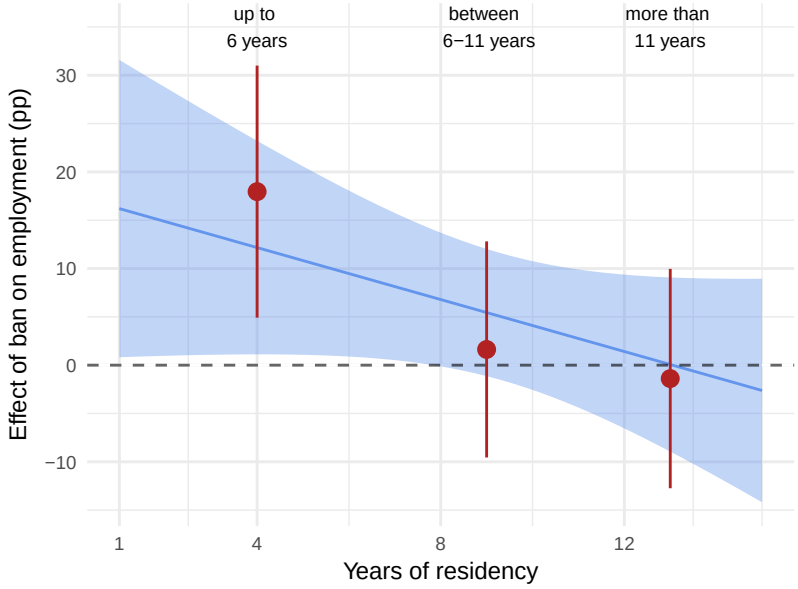

Fig. S4. **Short- and long-term effects of, on average, seven additional months of employment ban on refugee employment (male respondents)**. The Figure shows the effect of an on average 7-month longer employment ban on the probability that refugees are employed in years one to sixteen after their arrival in Germany. The blue line shows the point estimates from the linear interaction effect model with corresponding 95% confidence interval ($n = 749$). Red point estimates and corresponding 95% confidence intervals show the corresponding effect sizes for a binning specification that relaxes the linear interaction effect assumption and estimates the effect at the median of each tercile of the length-of-residency variable.

Table S9. **Estimated difference in employment rates between 1999 and 2000 cohort by years of residency (male respondents)**. Shows the estimated marginal effects of the cohort indicator for various levels of length of residency based on the linear interaction specifications as described in equation 1 (male respondents only, $n = 749$).

Years of Residency	Marginal Effect	Standard Error
1	0.16	0.078
3	0.14	0.063
5	0.11	0.050
7	0.08	0.039
9	0.05	0.034
11	0.03	0.036
13	0.00	0.046
15	-0.03	0.059

Table S10**. Estimated difference in employment rates between 1999 and 2000 cohort by years of residency (male respondents, binning estimator)**. Shows the estimated marginal effects of the cohort indicator for three length of residencies based on the binning specifications as described in equation 2 (male respondents only, $n = 749$).

Years of Residency	Marginal Effect	Standard Error
4	0.18	0.067
9	0.02	0.057
13	-0.01	0.058

3.6 Effect on Reported Income

Figure S5 shows the replication of Figure 3 in the main text but using reported monthly net personal income (earned income and welfare transfers as an outcome variable). Unfortunately, the Mikrozensus does not include a variable that allows us to consistently separate monthly earned income and welfare transfers. Note that unemployed asylum seekers eventually become eligible for welfare benefits and therefore will report income from these transfers, which will reduce income difference between employed and unemployed respondents.

The results suggest that about four years after arrival, the 2000 arrival cohort, which faced a shorter ban, has on average a higher reported monthly income (about 200 Euros) than the 1999 arrival cohort. This is a 27 percentage increase over the average income for the 1999 arrivals in their fourth year after arrival. The effect is about 100 Euros larger for the men-only sample.

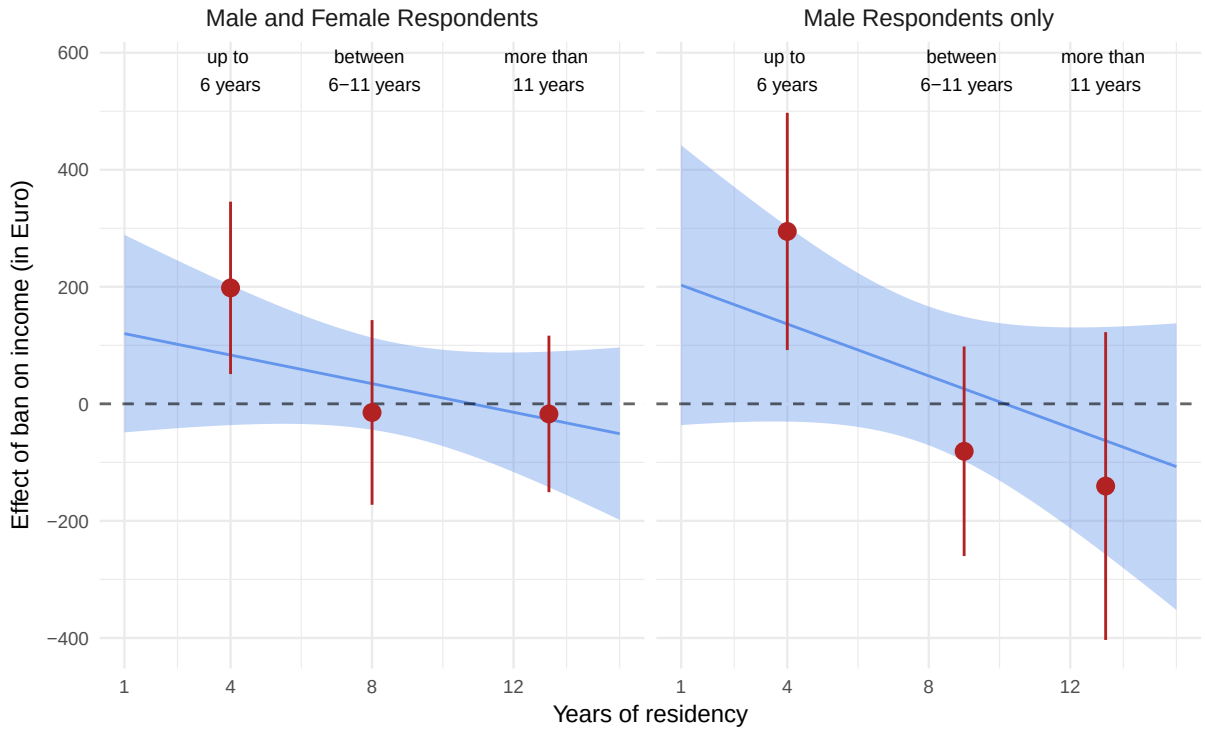

Fig. S5. **Short- and long-term effects of, on average, seven additional months of employment ban on monthly net personal income.** The Figure shows the effect of an on average 7-month longer employment ban on the reported monthly personal income (in Euros) in years one to sixteen after their arrival in Germany (full sample, $n = 1,645$, male respondents only, $n = 749$). The blue line shows the point estimates from the linear interaction effect model with corresponding 95% confidence interval. Red point estimates and corresponding 95% confidence intervals show the corresponding effect sizes for a binning specification that relaxes the linear interaction effect assumption and estimates the effect at the median of each tercile of the length-of-residency variable.

3.7 Social Cost Analysis

Our approach is as follows: Using the estimated effect of the employment ban, we estimate the total number of additional employed asylum seekers in the absence of the employment ban among the 40,500 Yugoslavians who arrived in Germany in 1999. Each of these additional jobs saves the taxpayer welfare benefits and creates revenue in the form of additional tax contributions on a monthly basis. We estimate the size of the saved welfare benefits using the reported average monthly personal income for the group of unemployed Yugoslavians in each Mikrozensus wave. We use the reported average monthly personal income for those who are employed and the annual standard gross tax rate for a family with 2 children to estimate the additional tax contributions. The reported personal income is the only variable that is consistently available in the Mikrozensus to make these calculations.

The calculation for the taxpayer's savings in a calendar year t can be expressed as a formula as follows

$$12 \times \underbrace{(\text{ban effect}_t \times \text{cohort size})}_{\text{additional employed}} \big(\underbrace{(\text{tax rate}_t \times \text{income}_t)}_{\text{tax contribution}_t} + \text{unspent welfare}_t \big)$$

The 40.8 million Euros we report in the main text is the average of the estimates for each calendar year between 2001 and 2009.

To illustrate the calculation, we use the data for 2006. We estimate that in 2006, a ban reduced the chances for employment by about 10 percentage points. This implies that in the absence of a ban we would expect about 4,000 additional employed asylum-seekers. The average reported monthly personal income for unemployed respondents is about 450 Euros while the reported personal income (after taxes) for an employed respondent is about 1,100 Euros. The gross annual tax rate for a family with 2 children is about 25%.

When we plug these values into the formula, we obtain an estimate about how much German taxpayers could have saved in 2006

$$12 \times (0.10 \times 40500) \times (((1100/(1 - 0.25)) - 1100) + 450) = 39.7$$