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# Does the cost of foreign workers affect the wages of local agricultural workers? Evidence from Israel

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***Abstract:*** *Modern agriculture often relies on foreign workers. Critics claim that it hinders investments in labor-saving techniques, and leads to unemployment of unskilled native workers. Proponents highlight the contribution of foreign workers to growth, especially in rural areas. This paper investigates whether the inflow foreign workers really affect the demand for local workers in agriculture. We exploit an 8% tax that was assessed on the wages of foreign workers in 2003. If foreign workers are substitutes to local unskilled workers, the demand for local unskilled workers should increase as a result of the tax, and their wages should increase, unless their supply is perfectly elastic. On the other hand, if unskilled workers, foreign or local, are complements to skilled agricultural workers, the demand of the latter should decline, and their wages should decline as well. We found, using a difference-in-difference regression approach, that the wages of local unskilled agricultural workers in Israel increased about 9% following the taxation of foreign worker wages, but the effect is not statistically significant, perhaps because of the small sample size. No changes in wages were found for skilled workers. To conclude, this research provides some support to the hypothesis that there is substitution between foreign workers and local unskilled Israeli workers in agriculture, but this conclusion is not strong enough statistically.*

***Key words:*** *foreign workers; agricultural wages; difference-in-difference*

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## Introduction

Many countries allow foreign workers to be employed in agriculture. There are different opinions about their effect on the local labor market. Theoretically, the increased supply of labor is expected to drive some local workers out of employment and/or reduce wages. However, if workers are heterogeneous in their qualifications, some of them can be substitutes to foreign workers while others could be complements. The literature on the impact of foreign workers is a subset of the literature on migration. Razin and Sadka (2000) and Shimada (2005) showed theoretically that an inflow of low-skilled immigrants benefits the local labor force in open economies. Empirical work often found that even if immigration negatively affects employment and wages of local workers, the effect is quantitatively small (Blau and Mackie, 2016). This finding is supported by the observations that foreign workers tend to chose destination counties in which the labor market is flourishing (Friedberg and Hunt, 1995).
Constant (2014) reviewed empirical studies of the effects of low-skilled immigration on local workers and concluded that the negative effect on local low-skilled workers is limited, and in any case is outweighed by the overall positive effect of immigration on the local economy. Kerr and Kerr (2001) also surveyed the empirical literature and concluded that even large-scale immigration does not have considerable effects on the local labor market. Dadush (2014) focused on low-skill immigrants and reached a similar conclusion. Cattaneo *et al.* (2015) examined data from 11 European countries and found that local workers benefit from immigration.

Most empirical studies relied on some exogenous even that enables the identification of the causal effect of immigration on the local labor market. Card (1990) found that the arrival of Cuban refugees to Miami in 1980 did not affect local employment and labor. Friedberg (2001) reached a similar conclusion in the case of the immigration from the Former Soviet Union to Israel in the 1990s. On the other hand, Tumen (2016) showed that the arrival of Syrian refugees in Turkey has led to a decline in local employment in some regions. More specifically, in the case of agriculture, Malchow-Møller *et al.* (2013) found that employing foreigners on Danish farms contributed to the expansion of those farms but to a decline in the employment of local workers. Foged and Peri (2016) showed that the arrival of refugees in Denmark in the mid-1990s allowed local workers to climb up the wage ladder. Card (2009) and Ottaviano and Peri (2012) found that immigration into the US slightly increased the wages of local unskilled workers, while more significantly reduced the wages of former immigrants. Clemens *et al.* (2018) found that restricting the arrival of foreign farm workers into the US in the 1960s did not affect local workers, while changing the farms' crop portfolio in the direction of less labor-intensive crops and increasing the adoption of labor-saving production techniques. The conclusion is that the effects of an inflow of workers into a local labor market depends on the qualifications of the newcomers vis-à-vis the qualifications of local workers, on labor market regulations such as minimum wage, and on other case-specific circumstances.

In the context of agriculture, Kislev (2003) suggested a theoretical model to assess the impacts of an inflow of cheap foreign workers on the agricultural sector of the host country. He assumed that the inflow of cheap foreign workers drives down the wages of local workers, and predicted that this will crowd out both local hired labor and farm operators, as farms become fewer and larger. However, he did not differentiate between skilled and unskilled hired workers. Kimhi (2014) extended the model such that skilled and unskilled workers are different inputs in agricultural production, and assumed that they are complements. He examined two alternative scenarios, depending on whether the supply of local unskilled workers is infinitely elastic or not. We can plausibly focus on the second scenario, given the vast anecdotal evidence that all the attempts by the Ministry of Agriculture to encourage Israeli workers to replace the foreign workers have failed completely for years, despite generous incentives to both workers and employers. In this case, the inflow of cheap unskilled workers is expected to drive down the wage of local unskilled workers. However, the total (local and foreign) number of unskilled workers increases, and this in turn induces an increase in the demand for skilled workers and an increase in their wages, unless their labor supply is perfectly elastic.

In this paper, we analyze the effect of changes in the supply of foreign agricultural workers on the wages of local agricultural workers in Israel. We exploit at tax that was levied on the wages of foreign workers in Israel, and examine its impact on the wages of skilled and unskilled salaried agricultural workers using a difference-in-difference approach. We find that the wages of local unskilled agricultural workers increased about 9% following the taxation of foreign worker wages, but the effect is not statistically significant, perhaps because of the small sample size. No changes in wages were found for skilled workers. These results provide some, but inconclusive, support for the claim that foreign workers are substitutes for unskilled local workers and complements to skilled local workers.

The next section provides some background on the employment of foreign workers in Israel in general and in agriculture in particular.

## Historical background

Foreign labor became an issue in Israel since 1967, when Palestinians from the West Bank and Gaza were allowed to work in Israel (Bartram, 1998). In the mid-80s, Palestinians comprised 7% of hired labor

as a whole, 25% of hired labor in agriculture and 45% of hired labor in construction. The worsening security situation in the early 1990s preventing many Palestinian workers from showing up for work on a regular basis (Angrist, 1996), and the government yielded to the pressure of employers and allowed them to hire workers from a number of foreign countries, including Thailand (mostly for agriculture), The Philippines (mostly for home care), China, Portugal and Romania (mostly for construction). The fraction of non-Palestinian foreign workers in the Israeli labor market reached a record-high 10% in 2002 (figure 1), but the high unemployment rate at that time pushed the government to limit their employment in some sectors (especially construction), and their share in the labor force declined somewhat since then (see also Kemp, 2010; Miaari and Sauer, 2011).

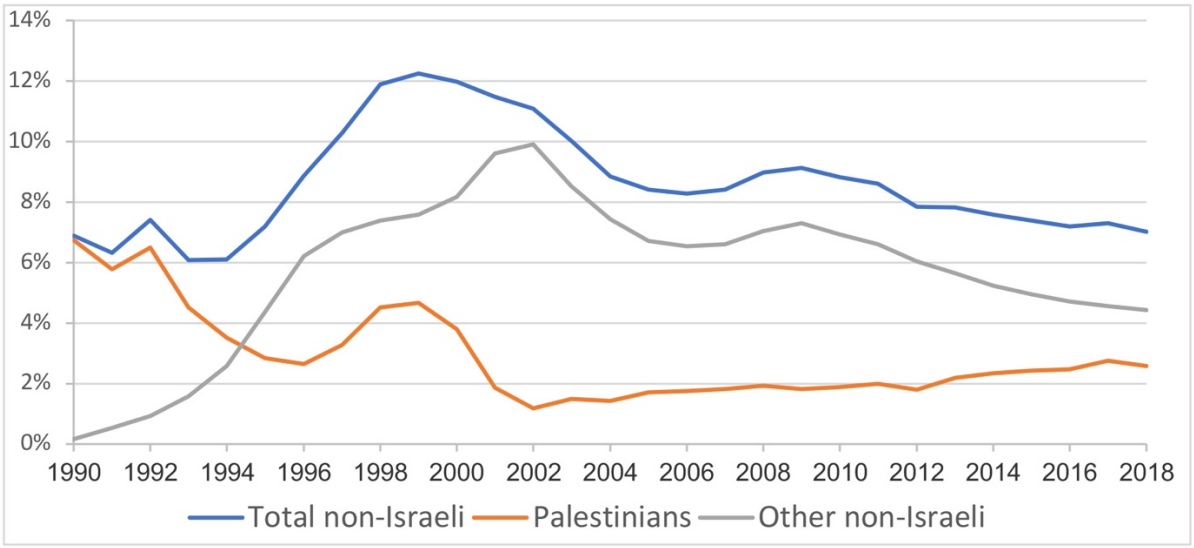


***Figure 1. The share of non-Israeli workers in the labor market****. Source: Bank of Israel.*

Figure 2 shows the evolution of the labor force in agriculture over the years. The arrival of the Palestinian workers after 1967 reduced the number of Israeli hired employees, but the arrival of the Thai workers after 1993 had the opposite effect. While the number of self-employed in agriculture continued to decline, the number of hired Israelis started increasing. This has led Kimhi (2014) to conclude that on the average, the foreign workers are complements to the Israeli hired employees in agriculture. Kimhi and Hanuka-Taflia (2020) distinguished between different types of hired workers, and found that the wages of unskilled workers in agriculture declined between 1995 and 2008, compared to wages of similar workers in other industries, while the wages of skilled workers and other types of workers increased.

## Methodology

As part of the efforts to increase the employment of Israelis during the recession of 2001-2003, the government levied a tax on the wages of foreign workers (not including Palestinians and home-care workers). The tax came into effect in 2003. The tax rate was initially 8%, and it was raised to 10% in 2006. In 2010, the tax rate was raised to 15% in construction and manufacturing and to 20% in other industries, excluding agriculture. In 2016 the tax was abolished for agricultural workers.

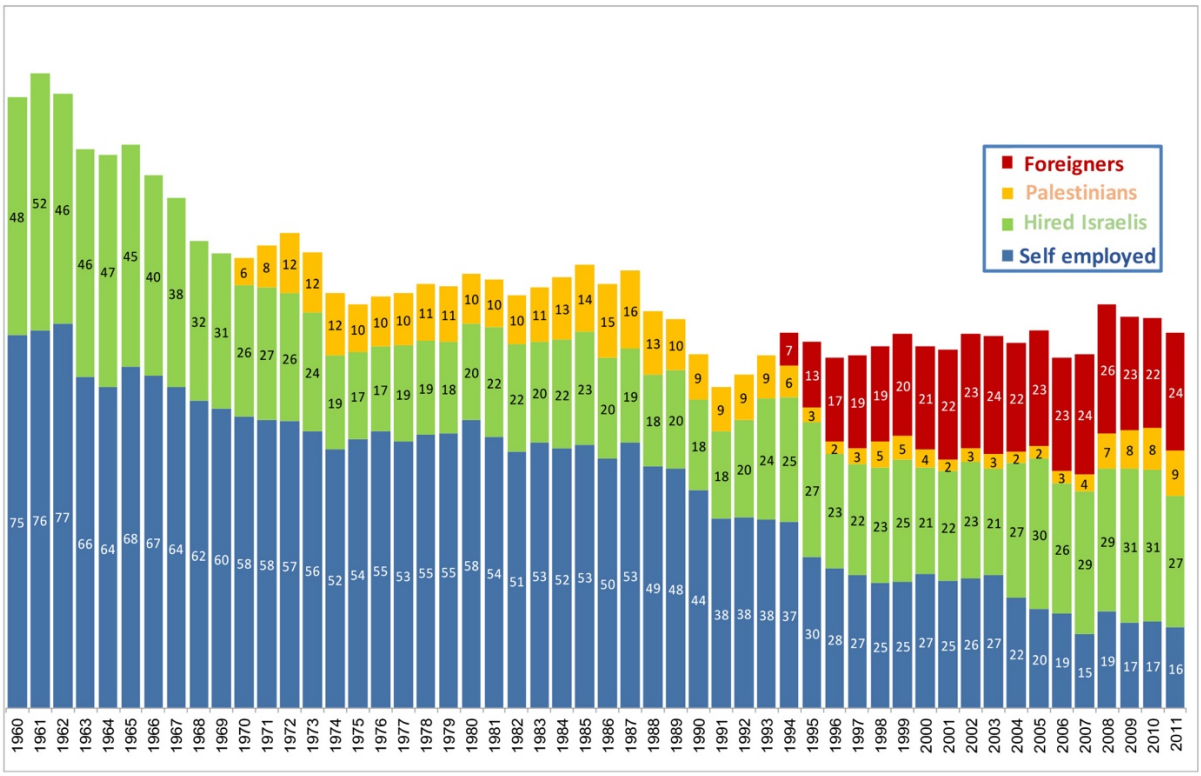


***Figure 2. Number of employed in agriculture, forestry and gardening in Israel (thousands).*** *Source: Israeli Central Bureau of Statistics.*

In this paper we focus on the initial change of the tax on foreign workers in agriculture, from 0% to 8%, in 2003. We treat this policy change as a natural experiment that made foreign workers more expensive to employees compared to local workers, and examine the resulting changes in the wages of local workers, distinguishing between skilled and unskilled workers. We use a difference-in-difference regression model applied to a sequence of cross-sectional data sets of the form

$$lnwage_{it} = \beta_1 X_i + \beta_2 year_t + \sum_{j=1}^{n} (\beta_{3j} industry_{ijt} + \beta_{4j} taxyear \times industry_{ijt}) + \varepsilon_{it} \qquad (1)$$

where *lnwage* is the natural log of real hourly wage of worker *i* in year *t*, *X* is a vector of worker characteristics (gender, age, education, marital status), {*year*} are a set of year dummies, {*industry*} are a set of industry dummies, and *taxyear* is a dummy for the years 2003 and up (after the tax went into effect). The industry dummies include agriculture, construction and manufacturing, since these are the industries employing most of the skilled and unskilled workers. The reference industry is "all other industries". The coefficient $\beta_{4j}$ is the treatment effect for industry *j*.

The data were taken from the Household Expenditures Surveys for the years 1998-2009. The regression is estimated first for the years 1998-2006 and then for the years 1998-2009, in order to see if the 2003 tax has a short-term or a long-term effect on wages. Only workers whose occupation is "skilled workers" or "unskilled workers" are considered, and the regression is estimated separately for skilled and unskilled workers. Both wage and occupation are observed only for people who worked in the previous 3 months. Table 1 lists the number of observations by industry.

| Sample years | Agriculture | Construction | Manufacturing | Other | Total |
|---|---|---|---|---|---|
| **Unskilled** | | | | | |
| 1998-2006 | 106 (2.1%) | 249 (5.0%) | 845 (16.9%) | 3788 (75.9%) | 4988 |
| 1998-2009 | 138 (2.1%) | 314 (5.0%) | 1024 (16.2%) | 4834 (76.6%) | 6310 |
| **Skilled** | | | | | |
| 1998-2006 | 366 (3.5%) | 1955 (18.6%) | 4839 (45.9%) | 3381 (32.1%) | 10541 |
| 1998-2009 | 480 (3.5%) | 2574 (18.6%) | 6328 (45.7%) | 4478 (32.3%) | 13860 |

***Table 1. Numbers and fractions of observations by industry.***

Table 2 provides the means of the variables used in the regression, for the years 1998-2009. Wages are higher for skilled than for unskilled workers, and this reflects the fact that they are more educated than average, older (except for "other" industries), they are more likely to be married, and perhaps most importantly, they are predominantly males. Wages in agriculture are the lowest, and they tend to be higher in construction, then manufacturing, and highest in "other" industries.

| Variable | Agriculture | Construction | Manufacturing | Other |
|---|---|---|---|---|
| **Unskilled** | | | | |
| real hourly wage | 27.46 (9.83) | 28.69 (11.1) | 29.79 (13.6) | 31.01 (14.6) |
| age | 36.33 (13.2) | 32.28 (11.7) | 39.69 (13.1) | 41.84 (13.4) |
| years of schooling | 10.85 (3.12) | 10.48 (2.81) | 11.34 (3.21) | 11.27 (3.61) |
| married | 0.59 (0.49) | 0.49 (0.50) | 0.66 (0.48) | 0.64 (0.48) |
| male | 0.54 (0.50) | 0.94 (0.23) | 0.59 (0.49) | 0.51 (0.50) |
| **Skilled** | | | | |
| real hourly wage | 33.67 (15.4) | 34.57 (15.2) | 37.56 (19.0) | 43.15 (23.7) |
| age | 37.23 (12.5) | 35.89 (11.7) | 40.73 (12.0) | 39.54 (12.2) |
| years of schooling | 10.95 (3.52) | 11.07 (2.69) | 11.95 (2.75) | 11.74 (2.44) |
| married | 0.65 (0.48) | 0.67 (0.47) | 0.76 (0.43) | 0.74 (0.44) |
| male | 0.87 (0.34) | 0.99 (0.10) | 0.81 (0.40) | 0.94 (0.23) |

***Table 2. Variable means and standard deviations (in parentheses).***

## Results

| Variable | 1998-2006 | | | 1998-2009 | |
|---|---|---|---|---|---|
| | unskilled | skilled | | unskilled | Skilled |
| age | 0.0200*** | 0.0288*** | | 0.0209*** | 0.0304*** |
| | (6.87) | (10.87) | | (8.36) | (13.72) |
| age squared | -0.0002*** | -0.0002*** | | -0.0002*** | -0.0003*** |
| | (-5.87) | (-7.59) | | (-7.37) | (-10.05) |
| schooling | 0.0117** | 0.0430*** | | 0.0171*** | 0.0430*** |
| | (2.11) | (6.67) | | (3.64) | (8.30) |
| schooling squared | -0.0006** | -0.0008*** | | -0.0007*** | -0.0008*** |
| | (-2.11) | (-3.03) | | (-3.06) | (-3.41) |
| married | 0.0381*** | 0.0906*** | | 0.0462*** | 0.0828*** |
| | (2.78) | (7.86) | | (3.76) | (8.32) |
| male | 0.1127*** | 0.2800*** | | 0.1064*** | 0.2650*** |
| | (9.32) | (21.88) | | (9.87) | (23.56) |
| agriculture | -0.0850* | -0.1347*** | | -0.0867* | -0.1351*** |
| | (-1.81) | (-4.21) | | (-1.84) | (-4.23) |
| agriculture2003+ | 0.0946 | 0.0387 | | 0.0259 | 0.0202 |
| | (1.25) | (0.87) | | (0.41) | (0.50) |
| construction | -0.0713* | -0.1392*** | | -0.0684 | -0.1390*** |
| | (-1.69) | (-7.85) | | (-1.64) | (-7.84) |
| construction2003+ | 0.0305 | 0.0174 | | 0.0255 | 0.0218 |
| | (0.63) | (0.69) | | (0.55) | (0.97) |
| manufacturing | -0.0414** | -0.1013*** | | -0.0425** | -0.1032*** |
| | (-1.97) | (-6.75) | | (-2.02) | (-6.90) |
| manufacturing2003+ | -0.0200 | 0.0283 | | -0.0126 | 0.0177 |
| | (-0.66) | (1.36) | | (-0.46) | (0.96) |
| intercept | 2.7529*** | 2.2234*** | | 2.7015*** | 2.2090*** |
| | (41.41) | (33.53) | | (46.25) | (39.65) |
| Year dummies | included | included | | included | included |
| N | 4988 | 10541 | | 6310 | 13860 |
| $R^2$ | 0.0561 | 0.1825 | | 0.0621 | 0.1802 |

***Table 3. Regression results (dependent variable is log hourly wage).***

The regression results appear in table 3. Beginning with the 1998-2006 regression, we find that wages first increase and then decrease with age and schooling, and the increase seems to be faster for skilled workers compared to unskilled workers, especially in the case of schooling. Married workers have higher wages, and this effect is also stronger for skilled workers. The gender wage gap is around 11% for unskilled

workers and 28% for skilled workers. Wages in all three industries (agriculture, construction and manufacturing) are lower than in the other industries, and the gaps are wider among skilled workers.
The treatment effect for unskilled agricultural workers is estimated at +9.5%, meaning that this is the average wage increase in the years 2003-2006 compared to 1998-2002, due to the tax levied on foreign workers. This implies that unskilled agricultural workers and foreign workers are substitutes, as hypothesized. However, this treatment effect is not statistically significant, perhaps due to the small number of unskilled agricultural workers in the sample. The treatment effects for unskilled construction and manufacturing workers are +3% and -2%, respectively, but both are far from being statistically significant. For skilled workers, the treatment effects in all three industries are positive, but small and insignificant.
Extending the sample to include the years 2007-2009 enables to examine whether the treatment effects are temporary or sustainable. The only quantitatively meaningful change in the regression coefficients is that the treatment effect for unskilled agricultural workers becomes much smaller. And this is despite the fact that the tax on foreign workers was raised from 8% to 10% in 2006. This may indicate that the agricultural sector adjusts to the higher cost of labor, either by using more labor-intensive production techniques or by shifting to less labor-intensive crops, which is what Clemens *et al.* (2018) found in the case of the US.

## Summary, discussion and conclusion

Foreign workers are hypothesized to be substitutes for local unskilled workers and complements to skilled workers. Hence, the tax levied on foreign workers in agriculture, construction and manufacturing in 2003 was expected to raise the wages of unskilled workers and lower the wages of skilled workers in those industries. Using difference-in-difference regression models, we found no significant effects of the tax on the wages of local skilled and unskilled workers. The only effect that was quantitatively meaningful is the 9.5% rise in the wages of unskilled agricultural workers during 2003-2006. We presume that this effect failed to reach statistical significance because of the small number of unskilled agricultural workers in the sample. Other possible reasons that might have reduced our ability to identify the true treatment effects are (1) other changes in industry-specific economic conditions that occurred over time and (2) the lack of information on Palestinian workers, who are supposed to be substitutes for foreign workers and were not subject to the tax.
Extending the sample through 2009, the increase in the wages of unskilled workers in agriculture becomes much smaller. This implies that the effect of the tax on foreign workers vanishes over time. This could be explained by the shift to less labor-intensive agricultural activities and/or the adoption of labor-intensive production techniques.
Future research could be based on administrative wage data that has become available in recent years. Using panel data could also help by enabling the examination of movements of workers across sectors. In addition, as more recent data becomes available, it could be possible to examine the effect of the cancelation of the tax on foreign workers in agriculture in 2016.

### References

Angrist J.D., 1996. Short-run demand for Palestinian labor, *Journal of Labor Economics*, 14, 3, 425-453.
Bartram D.V., 1998. Foreign workers in Israel: history and theory, *International Migration Review*, 32, 2, 303-325.
Blau F.D., Mackie C., 2016. The economic and fiscal consequences of immigration: A report. *National Academies of Sciences, Engineering, and Medicine, Washington, DC.*

Borjas G.J., Monras J., 2017. The labour market consequences of refugee supply shocks, *Economic Policy*, 32, 91, 361-413.

Card D., 1990. The Impact of the Mariel Boatlift on the Miami Labor Market, *ILR Review*, 43, 2, 245-257.

Card D., 2009. Immigration and inequality, *American Economic Review*, 99, 2, 1-21.

Cattaneo C., Fiorio C.V., Peri G., 2015. What happens to the careers of European workers when immigrants "take their jobs? *Journal of Human Resources,* 50, 3, 655-693.

Clemens M.A., Lewis *E.G.*, Postel H.M., 2018. Immigration restrictions as active labor market policy: Evidence from the Mexican bracero exclusion, *American Economic Review*, 108, 6, 1468-1487.

Constant A.F., 2014. Do migrants take the jobs of native workers? *IZA World of Labor* 10.

Dadush U., 2014. The effect of low-skilled labor migration on the host economy. KNOMAD Working Paper 1.

Foged M., Peri G., 2016. Immigrants' effect on native workers: New analysis on longitudinal data, *American Economic Journal: Applied Economics*, 8, 2, 1-34.

Friedberg R.M., 2001. The impact of mass migration on the Israeli labor market, *The Quarterly Journal of Economics*, 116, 4, 1373-1408.

Kemp A., 2010. Reforming policies on foreign workers in Israel. *OECD Social, Employment and Migration Working Papers*.

Kerr S.P., Kerr W.R., 2011. Economic impacts of immigration: A survey. NBER Working Paper No. w16736.

Kimhi A., 2014. Are migrant agricultural workers replacing the local workforce? Discussion Paper No. 10.14, The Center for Agricultural Economic Research, Rehovot, Israel.

Kimhi A., Hanuka-Taflia N., 2020. Do foreign workers affect local wages: Evidence from Israeli agriculture. Discussion Paper No. 1.20, The Center for Agricultural Economic Research, Rehovot, Israel.

Kislev Y., 2003. *Foreign Labor and Farm Structure*. Unpublished Manuscript, available at http://departments.agri.huji.ac.il/economics/teachers/kislev_yoav/yoav-f-labor.pdf

Malchow-Møller N., Munch J.R., Seidelin C.A., Skaksen J.R., 2013. Immigrant workers and farm performance: Evidence from matched employer-employee data, *American Journal of Agricultural Economics*, 95, 4, 819-841.

Miaari S.H., Sauer R.M., 2011. The labor market costs of conflict: Closures, foreign workers, and Palestinian employment and earnings, *Review of Economics of the Household*, 9, 1, 129-148.

Ottaviano G.I., Peri G., 2012. Rethinking the effect of immigration on wages, *Journal of the European Economic Association*, 10, 1, 152-197.

Razin A., Sadka E., 2000. Unskilled migration: A burden or a boon for the welfare state? *Scandinavian Journal of Economics* 102, 3, 463-479.

Shimada A., 2005. Foreign worker participation in labor markets and the economy's welfare. *Journal of Policy Modeling* 27, 355-362.

Tumen S., 2016. The economic impact of Syrian refugees on host countries: Quasi-experimental evidence from Turkey, *American Economic Review*, 106, 5, 456-460.