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Do Immigrants Affect Labor Market Disparities? Evidence from a Natural Experiment

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Evidence from a Natural Experiment

Muhammad Asali*

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Abstract

This study exploits the natural experiment, provided by the start of the second intifada, to measure the effect of immigration on labor market outcomes of Israeli-Arabs and Jews. It finds that Immigrants of different origins, Palestinians versus Foreigners, have different effects on the labor market, and these effects are experienced differently by different native groups, suggesting that the degree of substitution with native workers varies between groups. More specifically, a 10% foreign-worker-induced increase in the supply in a particular industry reduces the wage of Arabs by about 1%, while having no effect on Jewish wages. Palestinian-induced increase in the supply in a particular industry, in contrast, has the opposite effect: it reduces the wage of Jewish workers by about 1% but *increases* the wage of Arabs by 2.5%. Employment opportunities of either Arabs or Jews are not significantly affected by foreign workers, but are harmed by Palestinian influxes (in the scale of 1.5% for Arabs and 0.5% for Jews, for a 10% Palestinian-induced increase in the supply in a particular industry). Simulation analyses show that immigration of Palestinians and foreign workers together explain 7.6% of the increase in the wage gap between Israeli Arabs and Jews in the 1990s. They provide no explanation for changes in the employment gap.

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1 Introduction

On September 30, 2000 the second *intifada* erupted.[1] The number of Palestinians employed in Israel, consequently, dropped by 84,000 workers (about 7% of the Israeli, male workforce). This study uses this natural experiment to study the effect of immigration on labor market outcomes of natives (Israeli Arabs and Jews). In doing so it uses border closures as an instrument for the number of Palestinian workers in Israel, and the number of "worker permits"—utilizing slack enforcement and inefficiencies in their issuance—as an instrument for the number of foreign guest workers in Israel.

Many studies attempt to estimate the effects of immigration on the labor market outcomes of disadvantaged groups in the US economy (Card (1990); Altonji and Card (1991); Borjas (2003); and Borjas *et al.* (2006)). The evidence is inconclusive, and at times contradictory (Card (2001); Borjas (2003)), but most previous estimates suggest that the effects are small (Friedberg and Hunt (1995)). Many of the earlier studies, however, focus on the correlation between labor market outcomes in a locality and the extent of immigrant penetration in that locality.[2] This method may produce confusing evidence of the effects of immigration on the labor market, since the effects are likely to be diffused throughout the national economy by the internal migration of natives (Borjas (1999)).

Moreover, some of these studies treat immigration as exogenous, possibly producing

[1] "[intifada:]... an armed uprising of Palestinians against Israeli occupation of the West Bank and Gaza Strip..." Merriam-Webster's Online Dictionary <http://www.m-w.com>.

[2] Also referred to as "Spatial Analyses" studies.

biased estimates of the effect.[3] Also, the origin of immigrants in these studies is not controlled for, while it is possible that heterogeneity of groups of immigrants yields heterogeneous effects on the labor market. Finally, immigrant inflows to the US are relatively small. Would large, sharp shocks to the immigrant stock produce similar effects?

The Israeli economy in the 1990s and the early 2000s makes an interesting case for studying the effect of immigration on labor market outcomes of, and disparities between, native groups. First, in this period there were large and rapid changes in the wage and employment gaps between Israeli Arabs and Jews in the Israeli labor market.[4] Second, Israel being a small state—slightly smaller than New Jersey—effects are almost always studied on a "national" basis, therefore internal migration does not impose difficulties in measuring the effect of immigration. Finally, the number of immigrant workers—Palestinians and foreign guest workers—was increasing in this period, and a great portion of the variation in their numbers was the result of the intifada and security-based border closures between Israel and the West Bank and Gaza Strip.[5]

I find that immigrants of different origins have different effects on the labor market. These

[3] Clear exceptions to this generalization include Card (1990), Hunt (1992), and Friedberg (2001), to name but some. Theses studies use "natural experiments" to measure the effect of immigration on labor market outcomes of natives, and in most cases find small or no effect.

[4] See Chapter 1 for wage gap description.

[5] By "immigrants" I refer to Palestinians and foreign, guest workers in Israel. These differ in some important aspects. First, Palestinians reside in their homes in the West Bank or Gaza Strip, while foreign workers have to live in Israel, close to their workplace. Second, Palestinians have a better channel of communication with their Jewish employer—through Israeli Arabs who generally know both Hebrew and Arabic. Also, the Arabic-Hebrew language barrier is much weaker than the foreign-Hebrew one, where "foreign" can be Chinese, Urdu, Romanian, or any other non-semitic language. Third, Palestinians are considered "skilled-labor in industry," this generally means that they have industry-specific skills—specific training—that which foreign workers do not have upon their arrival.

effects are experienced differently by different native groups suggesting that the degree of substitution with native workers varies between groups. More specifically, a 10% foreign-worker-induced increase in the supply in a particular industry reduces the wage of Arabs by about 0.8%, while having no effect on Jewish wages. A Palestinian-induced increase in the supply in a particular industry has the opposite effect: it reduces the wage of Jewish workers by about 0.9% but seems to *increase* the wage of Arabs by 2.5%.

Employment opportunities either of Arabs or Jews are not significantly affected by foreign workers, but are harmed by Palestinian influxes (in the scale of 1.5% for Arabs and 0.5% for Jews, for a 10% Palestinian-induced increase in the supply in a particular industry).

In terms of gaps, a simulation shows that immigration of Palestinians and foreign workers together explain 7.6% of the (0.14 log points) increase in the wage gap between Israeli Arabs and Jews in the 1990s (and 10.7% of the change in the wage gap in the immigrant-employing industries). They, however, provide no explanation for the (1.7%) increase in the employment gap—actually, the overall contribution is negative (−25%) that is, the influx of immigration would have resulted in a *lower* employment gap, other things being equal, rather than the actual increasing gap observed.

The next section describes the background of this study, as regards populations involved and sociopolitical developments in the study period. Section 2.3 describes the data used in the study. Section 2.4 describes the theory and econometric methods used. The empirical findings are reported in Section 2.5. The intifada as an event study and robustness check

is examined in section 2.6. Section 2.7 simulates the possible effects of immigrants on labor market outcomes in the 1990s, and provides some predictions as to the effects on the different gaps. Section 2.8 concludes.

2 Background

The Israeli labor market employs Jewish workers—locally and foreign born; Arabs—locally born, who are natives and citizens of Israel (hereafter will be referred to as 'Israeli-Arabs');[6] foreign (overseas) workers, and Palestinians—residents of the West Bank and Gaza Strip (WBGS), who are not citizens of Israel.

Table 1 shows some major labor market statistics by ethnic group (nationality). While their share in the working age population is close to that in the general population, Arabs are much less represented in the labor force (less by 5.5%). The Arab participation rate is only about 75% of the Jewish participation rate; however, in the prime-age, male population, this portion is 93%–97%.

[6] In 2005, Israeli Arabs constituted about 19.6% of the total population, Jews about 76.1%, and the rest were either non-Arab Christians or without religion classification. See the Statistical Abstract of Israel 2006, Table 2.1, p. 86, Central Bureau of Statistics.

Table 1: Labor Market Statistics by Ethnic Group—1994 and 2004

	1994				2004			
	All		Males 25-65		All		Males 25-65	
	Arab	Jewish	Arab	Jewish	Arab	Jewish	Arab	Jewish
Working Age (15+)	607.9	3181.1	181.1	974.4	900.2	3975.8	298.6	1235.4
In Labor Force	255.5	1774.2	146.1	809.3	386	2292.5	226.2	1003.1
Participation Rate	42.03	55.78	80.69	83.05	42.88	57.66	75.76	81.2
Unemployment Rate	8.92	7.65	6.39	4.51	10.68	10.32	9.7	7.92
Employment Rate	38.28	51.51	75.53	79.30	38.30	51.71	68.41	74.77

NOTE.— *Source:* Calculations from the Labor Force Surveys of 1994 and 2004. Figures in thousands (and rates in %).

While exhibiting similar participation rates, in the prime-age, male population, the Arab unemployment rate is much higher. (It was 42% higher than the Jewish unemployment rate in 1994, and 22% higher in 2004.) As to wages, there is a stable ranking among the labor market participant groups: Jewish workers get the highest wages, then Israeli Arabs, Palestinians, and foreign workers.[7]

Palestinians were always a cheap source of unskilled labor. Mostly they were employed in construction and agriculture. However, in the early 1990s, with the eruption of the first Gulf war, and following some suicide bombing attacks, the government adopted a policy of closures. Palestinians were not (easily) allowed into the country anymore. This policy resulted in a severe shortage of labor.

About half a million Jewish immigrants, from the former Soviet Union, arrived in Israel just in the first three years of the last decade. They were relatively very educated, with 14–15 average years of schooling (Locher (2004)). The Russian immigration wave per se did not affect outcomes of natives: Friedberg (2001) exploits information about the Russian immigrants' former occupational distribution to estimate their effect on the wage and employment of natives in occupations which employed more Russians. She finds no adverse impact of this immigration on native outcomes—actually, at the individual level, she finds a statistically significant positive effect of this immigration wave on the wage growth of natives, and

[7] "Over the years, a clear hierarchy in the stratification system has been institutionalized in Israeli society in general, and in the labor market in particular, where Ashkenazim [Western Jews] are at the top of the socioeconomic ladder, Mizrahim [Eastern Jews] are in the middle, and the Arab citizens of Israel occupy the bottom echelons of the socioeconomic hierarchy . . ." p. 2, Cohen and Haberfeld (2003).

raises the possibility of complementarity between Russians and natives. The influx of Jewish, Russian immigrants, however, did not meet the Palestinian-induced shortage in labor.

On the one hand, these immigrants were relatively high skilled, and did not find construction—or any other low-skilled industry—to be a suitable job. That is, the immigration-driven supply shock did not meet the worker shortage.[8] On the other hand, the influx of immigrants required a rapid and substantial increase in construction employment, due to the surge in demand for housing.

The importation of foreign workers was the solution advocated by the government and employers, to meet the resulting worker shortage. These foreign workers came from different parts of the world: China, Thailand, the Philippines, Eastern Europe, and from African and Latin American countries. Due to closures and security concerns associated with the first (1987) and especially the second (2000) intifada, Israel began using foreign labor to replace Palestinian workers. A foreign workforce was much cheaper than any other type of available workforce—Jews, Israeli Arabs, or even Palestinians [see Susser (2004)].

According to some estimates, as in Susser (2004), the number of foreign workers reached an unprecedented level of 300,000 workers in 2003—about 11.5% of the total labor force, or 25% of the prime-aged, male labor force. Starting in 2002, however, the government initiated

[8] This fact is pronounced in the Bank of Israel's Annual Report of 1993:

> ". . . many of [the Russian immigrants] have not found work commensurate with their skills. This is particularly evident when the current influx of [high-skilled, MA] immigrants is compared with previous ones," Bank of Israel (1994), p. 92.

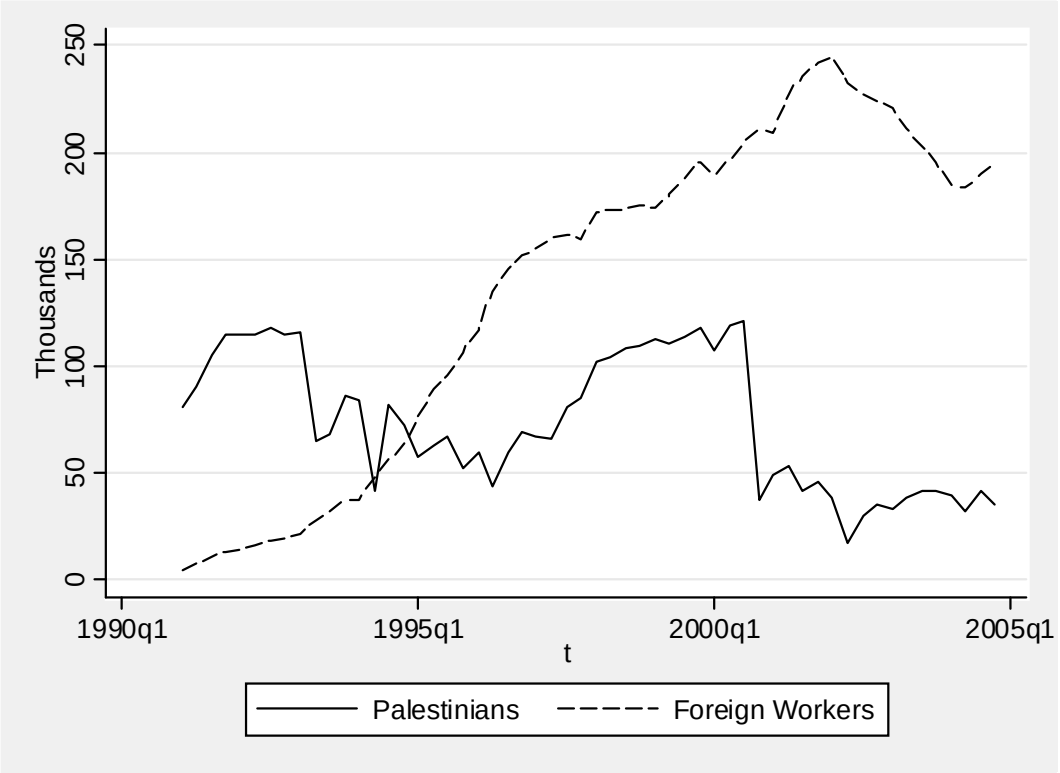

Figure 1: Foreign workers and Palestinians Employed in Israel, thousands

a strict deportation policy, after which the number of foreign workers started declining. Figure 1 shows the number of foreign workers and Palestinians employed in Israel in each quarter of the study period.

Wage and employment gaps, between Israeli Arabs and Jews, have existed as long as wages have been measured. Nonetheless, in the last decade, the gap increased, peaking around the year 1999, and declining thereafter. The wage gap between Israeli Arabs and Jews increased sharply in the 1990s, from 37% in 1991 to 61% in 1999 (for males the figures

are 46% and 77%, respectively).[9] These gaps, the levels and especially the rapid changes, exceed those measured for other groups and in other countries. For example, for the same period the male-female wage gap in Israel hovered between 15%–20% most of the time. Similar figures are reported for the gender wage gap in the United States.[10]

The increase in wage and employment gaps was accompanied by an increase in the number of foreign workers (and, after 1995, of Palestinians) in the Israeli labor force. Standard wage gap decompositions for the investigated period resulted in an "unexplained" (or discriminatory) gap of about 50% of the gross gap, and this portion was roughly stable over the whole period.[11] See Figures 2 and 3.

On the face of it, since human capital differences cannot explain about half of the existing wage gap, labor supply shocks might have driven the gaps. This study sets out to examine this hypothesis; more specifically, it examines the link between immigrant workers and labor market outcomes including disparities among natives, in wages and employment.[12]

[9] See previous chapter.

[10] See O'Neill (2003). The black-white wage gap was about 15-30% in the 1990s. (See Welch (2003).) Moreover, these gaps were generally declining rather than increasing.

[11] See Chapter 1. There, however, I only analyze wage gaps; notwithstanding, in a follow-up investigation, I studied the employment gaps in Israel and found roughly the same patterns.

[12] Mr. Beni Feferman, Chair of the Labor Force Planning Authority at the Israeli Ministry of Labor, stated a similar concern:

> " . . . in 2003, the employment of Israeli Arabs in the construction industry increased by 14% . . . this is because the police deported a high number of foreign workers besides the continuous closure clasped on the [Palestinian] territories . . . "

My translation of a news article published in Hebrew, on May 28, 2004 (Goldstein (2004)).

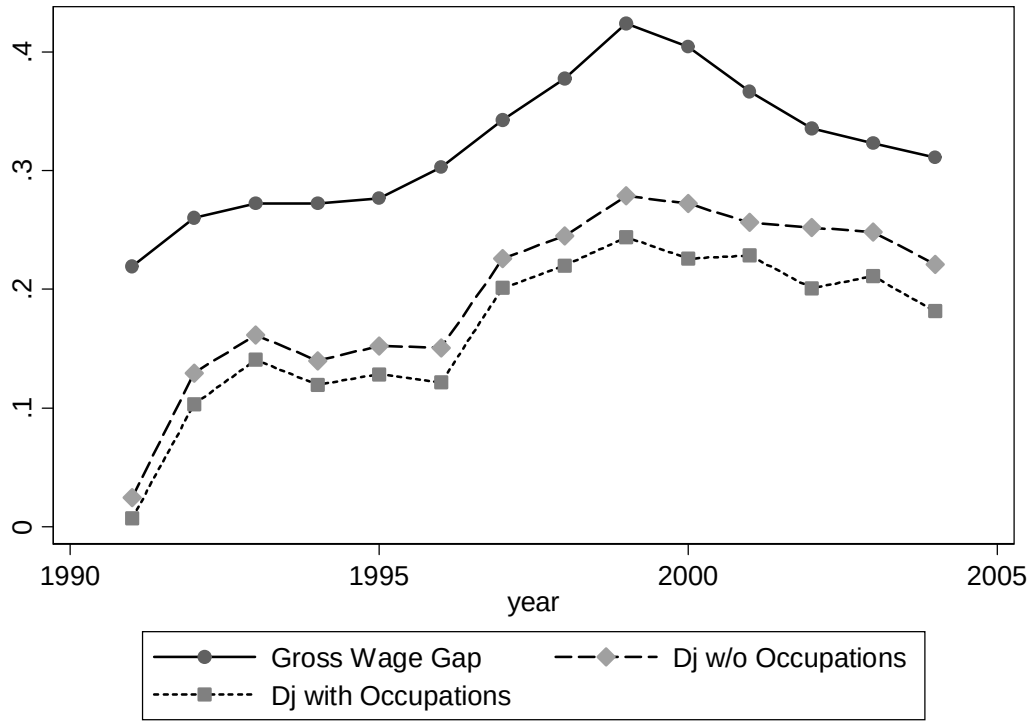

Figure 2: Arab-Jewish Wage Gap Decomposition—Gross, and Unexplained Gap

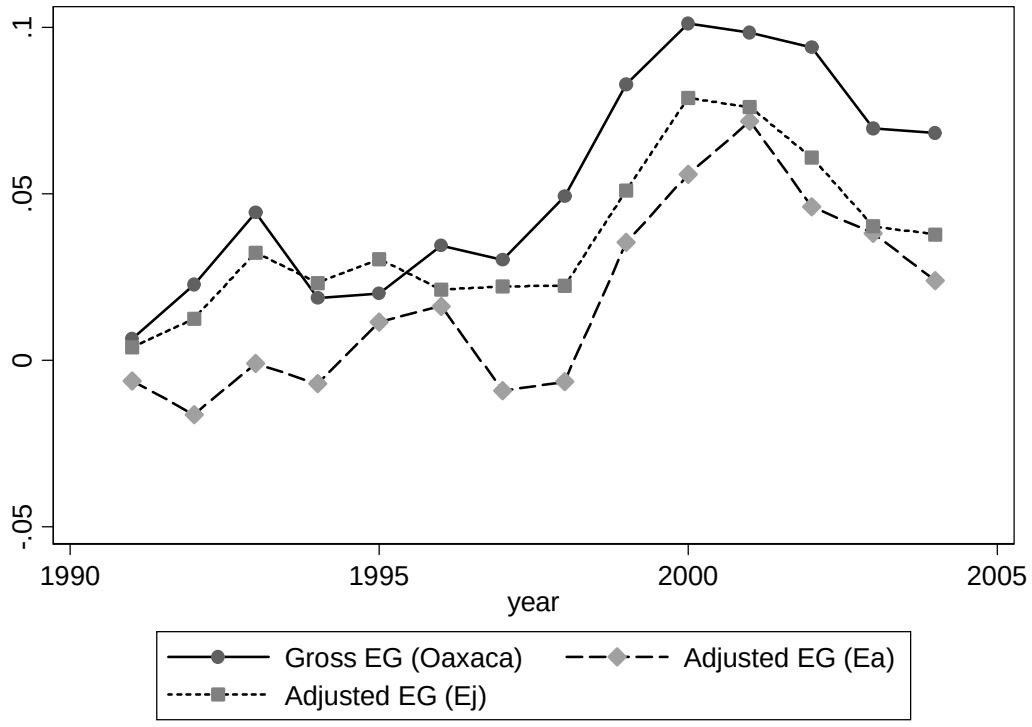

Figure 3: Arab-Jewish Employment Gap Decomposition—Gross, and Unexplained Gap

3 Data

This study uses data on wages, employment—of Israelis, Palestinians, and foreign (overseas) workers—closure days, conflict events, and foreign worker permits. I describe each data type and source in turn.

3.1 Microdata on Income and Employment

The analyses in this study are restricted to 18–64 year-old, male workers. See the data appendix (Appendix A) for the definition and construction of variables and a description of the files used.

Data on income are drawn from the income surveys conducted by the Central Bureau of Statistics (CBS) in Israel. Income surveys are based on questionnaires conducted at the household and individual levels and cover information on demographic, personal, and labor market characteristics. The samples include Jewish and non-Jewish respondents living exclusively in Israel. Hence all are residents and citizens of Israel.

Detailed data on employment come from the Labor Force Surveys (LFS), also conducted by the CBS. These are comprehensive surveys carried out on a quarterly basis; they include detailed information about employment, occupational and industrial affiliation, residence, workplace, job search, and unemployment. These data have a rotating panel format: each respondent is interviewed four times—in two consecutive quarters, then, after a two-quarters break, another two interviews in consecutive quarters. The income survey mentioned before

is a by-product of the labor force survey: it is conducted only among the fourth (outgoing) rotation group of the LFS. Note that foreign workers and Palestinians are *not* included in the income or labor force surveys: those surveys cover only *Israelis*.

In this study I group individuals into industry-quarter cells. That is, I calculate the average of the variable of interest, say the log of hourly wage, within each industry at each quarter.[13] In the data there are 15 industries—the "unknown" group included—and 56 quarters, from first quarter of 1991 to fourth quarter of 2004. Therefore, theoretically I have 840 observations for each ethnic group.[14]

Data on the number of employed Palestinians and foreign workers—coming from China, Thailand, the Philippines, Eastern Europe (mainly Romania and Moldova), and from African and Latin American countries—come from the Bank of Israel.[15] These data are based on the calculations of the CBS, the Institute of National Insurance, and Palestinian labor force surveys. While data on the number of employed Palestinians are reasonably accurate—they were collected by the Israeli CBS until 1995, when the Palestinian CBS started collecting the data—the numbers of foreign workers are, in contrast, an estimate, since many of them

[13] One reason for this grouping is that data on immigrants—foreigners and Palestinians—and closures are only available on a quarterly basis. Other reason for the grouping into industry is that Arab and Jewish workers are close to perfect substitutes within industry, as I find in the next sections. If industry is a good proxy for skill group then, assuming that immigrants and natives are perfect substitutes within skill (industry) group, this provides a better way to estimate the effect of immigration rather than just pooling all immigrants as homogenous input in the analyses (e.g., Card (2001); Card (2005)).

[14] "Theoretically" because, in specific industries at different quarters, it happens that we have no worker with positive reported income. For example, in the employment analyses I have 840 observations about Jewish workers and 836 observations about Arabs (that is only missing one year in one industry). But in the wage analyses I have 729 Arab observations and 833 Jewish observations.

[15] The Bank of Israel, Data Series Database, Employed from Territories and Foreigners, Retrieved March 1, 2006 from <http://www.bankisrael.gov.il/series/en>.

are illegally employed and thus hard to trace.[16] It is estimated that, by 2003, approximately 300,000 foreign workers were employed in Israel, 65% illegally.[17] Data on the distribution of foreign and Palestinian workers across industries were obtained from the Ministry of Trade, Industry, and Labor.[18]

Table 2 reports means of the main variables for men with positive income, from the income survey, over the study period. It is clear from the table that Jewish workers are more experienced, have more years of schooling, and are more likely to be married than Arab workers. Also, it is evident that the hourly wage of both Arabs and Jews was increasing over time, but that the wage gap, which was increasing in the 1990s, started declining afterwards. While some convergence in human capital characteristics occurred between Arabs and Jews, the gross wage gap did not follow the same path.

3.2 Conflict Events

Counts of the Israeli-Palestinian conflict events, as described in the media, come from the Kansas Event Data System (KEDS). The KEDS project uses automated coding of English-language news reports to generate political event data focusing on the Middle East and

[16] While most foreign workers start out with legal permits, many become illegal simply by losing or changing jobs, or when their working visa expires.

[17] Ellman and Laacher (2003), p. 8.

[18] I thank Mr. Beni Feferman, of the Ministry of Labor and Welfare, for providing access to the data. These data, however, are available only from 1995. For the years 1991–94 I imputed the true industrial distribution of foreigners in 1995 (or any specific quarter of that year, or the average distribution over 1995–2004, they are all similar and results are not sensitive to this imputation). All the same, for Palestinians in 1991–94 I used data on industrial distribution from the Palestinian CBS web site, <http://www.pcbs.gov.ps/DesktopDefault.aspx?tabID=3809&lang=en>.

Table 2: Sample Means of Key Variables

	ln($wage$)		Schooling		Experience		Married	
Year	Arab	Jew	Arab	Jew	Arab	Jew	Arab	Jew
1991	3.12	3.36	9.7	12.6	17.6	21.7	0.62	0.79
1992	3.09	3.40	9.9	12.6	18.8	22.0	0.66	0.79
1993	3.00	3.33	10.1	12.8	16.3	21.3	0.62	0.78
1994	3.04	3.36	10.6	13.0	16.3	21.0	0.63	0.76
1995	3.16	3.47	10.5	13.1	17.2	20.9	0.64	0.76
1996	3.10	3.42	10.5	13.1	17.3	20.8	0.62	0.74
1997	3.10	3.48	10.6	13.2	17.8	20.7	0.67	0.74
1998	3.14	3.52	11.0	13.5	17.7	20.6	0.69	0.73
1999	3.11	3.54	11.1	13.6	17.3	20.5	0.68	0.74
2000	3.14	3.56	11.3	13.5	16.8	20.4	0.66	0.72
2001	3.23	3.62	11.7	13.6	16.6	20.4	0.68	0.73
2002	3.21	3.57	11.4	13.7	16.7	20.4	0.68	0.72
2003	3.21	3.56	11.4	13.7	16.9	20.4	0.68	0.70
2004	3.24	3.57	11.4	13.9	17.2	20.3	0.69	0.70

NOTE.— *Source:* author's calculations from the income survey files. Samples are restricted to 18–64 years old, working men. Reported are weighted means, using sample weights provided by the CBS in the data.

other places in the world. These data are collected to be used in models predicting political changes. Specifically, I use the Levant Event-Type Counts Data Set.[19]

The events data are collected on a weekly basis. A conflict event can be either verbal or material, and this can be initiated by either Israel or Palestine. Therefore, there are four categories of conflict events. In my study I define one quarterly conflict variable (hereafter named $Conflict$), which is the sum of all categories of weekly conflict events over a given quarter.[20]

[19] I thank professor Philip A. Schrodt, from the department of Political Science at Kansas University, for providing me with these data.

[20] Using data from B'Tselem—The Israeli Information Center for Human Rights in the Occupied Territories, I built a violence index: combining the number of Israelis and Palestinians killed in the intifadas' events, for each year. On a yearly basis, this is highly correlated with my 'conflict' variable. However, I could not use this index in my analyses, since I have no fatalities data on a quarterly basis.

3.3 Days Under Closure

The term "closure" refers to movement restrictions, on Palestinian goods and workers, which Israel has imposed across borders and within the West Bank and Gaza Strip. Border closures—between Israel and the West Bank and Israel and the Gaza Strip—are reinforced by checkpoints set up along the border. Israel's restrictive policy on the residents of the occupied territories wishing to enter the country started in 1991 (Carmi (1999)). Imposing closures every now and then, however, was mostly motivated by Palestinian bomb attacks within Israel, or by intelligence information about such attacks.[21]

Data on the number of days-under-closure come from the United Nations Special Coordinator for the Middle-East Peace Process (UNSCO).[22] In this study I use the Effective Closure Days (ECD), which refers to the actual working week. That is, $ECD_{qy} = CCD_{qy} - \frac{1}{2}Fridays - Saturdays - Holidays$, where CCD_{qy} is the Comprehensive (total) Closure Days in quarter q of year y; $Fridays$, $Saturdays$, and $Holidays$ are the counts of those days within the quarterly CCD_{qy}.[23]

[21] "On 30 March 1993, in response to some of the highest levels of Arab-Jewish violence since the beginning of the Palestinian uprising, the Israeli government sealed off the West Bank and Gaza Strip, barring 130,000 Palestinians from their jobs in Israel. The March closure was the longest ever imposed lasting into the post-Oslo interim period . . ." p. 312, Roy (1995).

[22] I used the UNSCO days-under-closure data for the years 1993–2003 as presented in a study by Aranki (2004). The recent figures of 2004 are taken directly from the UNSCO web site (www.un.org/unsco/UNSCO/statistics), accessed on 9/20/2006. It seems that the UNSCO does not have data on closures before 1993, as it was established in June 1994 following the signing of the Oslo Accord. Hence, for the years 1991 and 1992, I use the closure days reported in a B'Tselem—The Israeli Information Center for Human Rights in the Occupied Territories—fact sheet. (See Carmi (1999).)

[23] In Israel, Friday is considered a half working day, Saturdays and Holidays are rest days, and Sunday through Thursday are full working days. ECD in this example refers to the (potential) loss of *actual* working days in Israel.

3.4 Foreign Worker Permits

The Ministry of Industry, Trade, and Labor (ITL), previously known as the Ministry of Labor and Social Affairs, issues foreign worker permits. Those permits are issued to employers who wish to employ foreign workers.[24] The National Employment Service (ES), a division in the Ministry of Labor, used to publish data on foreign worker permits. Now, in the ITL, the division issuing permits and maintaining data about foreign workers is the Foreign Workers Department. Data about foreign worker permits, that I use in this study, come from the ES.[25]

4 Theory and Methodology

To understand how immigration could affect wage and employment of natives, and possibly differently for Arab and Jewish workers, I use the theoretical model outlined in Borjas *et al.* (2006) with a slight modification. The native workforce consists of Arab and Jewish workers. These can be either employed in the formal market sector or in the home production sector (or, alternatively, consuming leisure). Hereafter I will refer to the non-market sector

[24] To be legally employed in Israel, two official documents are needed. First, the foreign worker permit, which is issued by the Foreign Workers Department of the ITL. Second, a worker visa, which is issued by the Ministry of the Interior. See a "Foreign Workers' Rights" pamphlet, published by the ITL, August 2006. Can be accessed online at: http://www.israeltrade.gov.il/NR/rdonlyres/DF7B8EC1-C998-47EE-B087-B207645ADD93/0/English_Final_April2006.pdf

[25] My data about foreign worker permits, for the years 1991–1995, come from Friedberg and Sauer (2003), Table 1, p. 5. Since only annual data is reported, I had to distribute the permits evenly acrorss the quarters in those years. I thank Sami Miaari, from the Hebrew University of Jerusalem, for helping me access the more recent data about foreign worker permits, collected from the ES publications.

as the home-production sector. The model assumes that workers are perfect substitutes within industry in the formal market sector,[26] and that Arabs and Jews have different home-production functions.[27]

For workers of ethnic group e ($e = Arabs$, $Jews$; denoted A and J hereafter) and industry i, the wage in the market sector is:

$$w_{ei} = X_{fi}\left(1-\delta_e\right)\left(L_{fi}\right)^{\eta_f}, \tag{1}$$

where X_{fi} is a labor demand shifter (subscript f stands for formal-market); δ_e is the discrimination coefficient, allowing different wages for Arab and Jewish workers due to employer discrimination, with $\delta_J = 0$ and $0 < \delta_A < 1$—Jewish-Arab wage differences are determined by the extent of employer discrimination, with $w_A/w_J = 1-\delta_A$. L_{fi} is the total employment in the formal market sector in industry i, that is, $L_{fi} = N_{Afi} + N_{Jfi} + P_i + F_i$, where N_{efi} is the native employment in industry i of group e; P_i is the number of Palestinians employed

[26] Using the framework set in Card and Lemieux (2001), I test this hypothesis for Israeli Arab and Jewish workers and cannot reject it at the 5% significance level. Namely, I run the regression $\ln\left(w_{Ait}/w_{Jit}\right) = -\frac{1}{\sigma}\ln\left(N_{Ait}/N_{Jit}\right) + \mu\ln\left(\varepsilon_{Ait}/\varepsilon_{Jit}\right)$, where w_{eit} is the hourly wage of group e ($e = Jew$, $Arab$) and industry i at time t. N is the number of natives in the specific group, and σ is the elasticity of substitution between Arabs and Jews. ε_{eit} is a parameter measuring efficiency, which I control for by including time fixed effects, industry fixed effects, and the Arab-to-Jewish ratio of schooling and experience in each cell. The null hypothesis of perfect substitution is that $-1/\sigma$ equals zero (that is, $\sigma = +\infty$). I find this to be 0.003 (standard error 0.025), failing to reject the Arab-Jewish substitution hypothesis. About "immigrants," though, it remains an assumption, since I have no microdata about their wages and characteristics.

[27] These two assumptions simplify the discussion but are not essential for the results of the model. What is essential for immigration to have different effects on Arab and Jewish outcomes is that the groups have different elasticity of labor demand in the home-production sector. Also, the impact of immigration on the accumulation of capital is ignored in this simple framework, for simplicity. Qualitatively, and as long as capital does not adjust immediately, the results of the model are the same. See Borjas *et al.* (2006).

in industry i, and F_i is the number of foreign workers employed in industry i. $\eta_f < 0$ is the inverse of the labor demand elasticity in the formal market sector.[28]

The inverse demand for labor in the home production sector (subscripted by h), is given by:

$$w_{ei} = X_{ehi} \left(N_{ehi}\right)^{\eta_{eh}}, \tag{2}$$

where X_{ehi} is a home-production demand shifter; N_{ehi} is the number of natives, of ethnic group e in industry i, employed in the home production sector. η_{eh} is the inverse of the labor demand elasticity in the home production sector. Note that this is assumed to be different for Arabs and Jews. The allocation of natives to employment in the market sector and home production is given by:

$$N_{ei} = N_{efi} + N_{ehi}, \ \forall e, i. \tag{3}$$

Figure 4 shows the potential effect of an influx of migrants on labor market outcomes of natives. The box shows the allocation of native labor between the formal and home sector. D_f is the labor demand curve in the formal sector, and D_h is the labor demand curve in the home production sector; these are aggregated demands, equal to the sum of the demand curves of Arabs and Jews in each sector (denoted D_h^A and D_h^J, in the graph, for the home production sector). The width of the box is the total number of natives (Arabs and Jews) available for allocation between the formal market sector and the home production sector.

[28] "Industry," in my analyses, is the equivalent of "skill-group" (which is generally defined in this literature by schooling-experience cells, as in Borjas (2003) and Borjas *et al.* (2006)). This is mainly a data restriction, since I have no individual-level data about immigrants, but I know their industrial distribution.

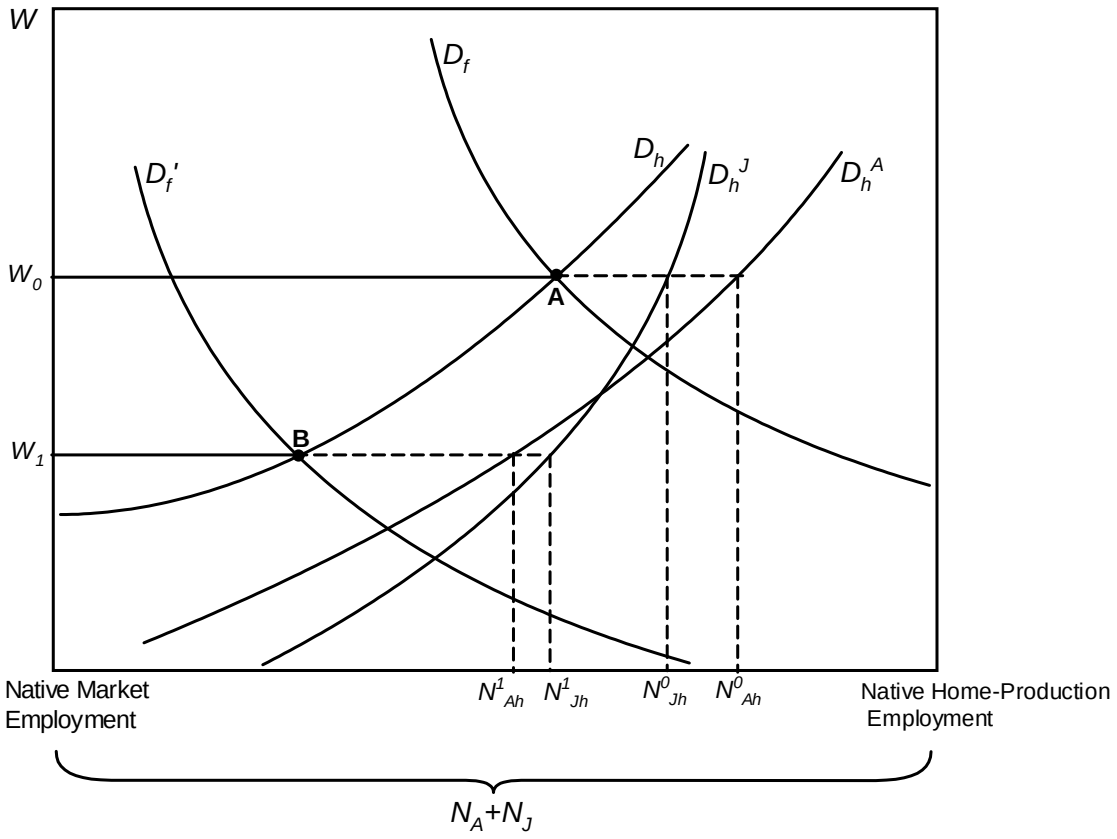

Figure 4: The Allocation of Native Labor Between the Formal Market Sector and the Home Production Sector

Initially the equilibrium is at point A. At this wage, W_0, the number of Arabs (Jews) in the home sector is N^0_{Ah} (N^0_{Jh}) (this is measured from the right). The number of Arabs (Jews) in the formal market sector is $N_A - N^0_{Ah}$ ($N_J - N^0_{Jh}$). As a result of the immigrant-induced labor supply shock, the demand for native labor decreases immediately (the curve D_f shifts down to D'_f). The new equilibrium is now at point B. Given that the width of the box is the total native labor available for market and home (this is fixed and equal to $N_A + N_J$), the resulting decrease in the number of natives in the labor market is balanced by an increase in natives in the home-production sector. Given a different elasticity of labor demand in the home sector, however, the employment of the different groups is affected differently. In this figure, the demand in the home sector is more elastic for Arab workers, and therefore their employment in the formal sector is more negatively affected by immigration than their Jewish counterparts: the number of Arabs in the home sector increases from N^0_{Ah} to N^1_{Ah}, while the number of Jewish workers in the home sector increases from N^0_{Jh} to N^1_{Jh}. It is clear from the graph that the increase in the number of Arabs in the home sector, and thus the decrease in their number in the formal market, is greater than their Jewish counterparts.

Equating Equations 1 and 2, linearizing the result using first-order Taylor approximation, and solving for L_{fi}, we arrive at the following pre-immigration wage (See Appendix B):

$$\ln w^*_{ei} = \ln\left[(1-\delta_e)X_{fi}\right] + \eta_f \ln\left(\alpha_i + \rho\left(N^*_{Ai} + N^*_{Ji}\right)\right), \tag{4}$$

where asterisks signify the pre-immigration levels of the variables, and ρ is a positive constant between 0 and 1, which is not ethnicity-specific or industry-specific, defined as:

$$\rho = \frac{\overline{N}_f}{\overline{N}_f + \frac{\eta_f}{\eta_{Ah}}\overline{N}_{Ah} + \frac{\eta_f}{\eta_{Jh}}\overline{N}_{Jh}} \tag{5}$$

and where $\alpha_i = -\rho\left(\alpha_{Ai} + \alpha_{Ji}\right)$, and $\alpha_{ei} = N^*_{ehi}\left(1 - \frac{1}{\eta_{eh}} - \frac{\eta_f}{\eta_{eh}} + \frac{X_{fi}/X_{ehi}}{\eta_{eh}\left(X^*_{fi}/X^*_{ehi}\right)}\right)$ $(e = A, J)$. See Appendix B for derivations of these results.

Assuming an influx of P_i Palestinians and F_i foreigners, it is easy to show that the post-immigration wage will be:

$$\ln w_{ei} = \ln w^*_{ei} + \eta_f \rho \left(f_i + p_i\right), \tag{6}$$

where $p_i = Palestinians_i/Israelis_i$, and $f_i = Foreigners_i/Israelis_i$, signifying the immigrant-induced supply shock.[29]

Note that only the "reduced-form wage elasticity," $\eta_f\rho$, is identified as a whole, and not the factor price elasticity, η_f. This, however, is identifiable if we assume that immigrants can only be employed in the formal market—that is, there are no unemployed immigrants; all those who enter the country are working in the formal sector, or otherwise they would

[29] Allowing the taste for discrimination to increase by h_e, that is, the new discrimination coefficient will be $\delta^1_e = \delta^0_e + h_e$ ($h_J = 0$, $-\delta_A \leq h_A \leq 1 - \delta_A$) a more general equation of the post-immigration period would be $\ln w_{ei} = \ln w^*_{ei} + \eta_f \rho m_i + d$, where $d = -\frac{h_e}{1-\delta_e}$ and $m_i = f_i + p_i$. Note that in the actual estimation of these equations I relax the assumption that foreigners and Palestinians have the same effect, and that X_{fi} is fixed over time.

not have been immigrating in the first place. This is a plausible assumption in the Israeli context (especially about Palestinians who are never counted as "unemployed" in Israel; they either work in Israel or are employed/unemployed in the WBGS), and therefore we may be measuring η_f rather than $\eta_f \rho$. Finally, it can be shown that the allocation of natives (of ethnic group e) between the formal sector and home-production sector, in the post-immigration period, is:

$$\ln N_{ehi} = \ln N^*_{ehi} + \frac{\eta_f \rho}{\eta_{eh}} (f_i + p_i), \tag{7}$$

$$\ln N_{efi} = \ln N^*_{efi} - \frac{N^*_{ehi}}{N^*_{efi}} \frac{\eta_f \rho}{\eta_{eh}} (f_i + p_i). \tag{8}$$

This simple framework facilitates the analyses in that it allows different response, of different native groups, to immigrant-induced labor supply shocks. This helps in estimating the group-specific effect of immigration, and therefore the possible effect of immigration on labor market disparities.

4.1 Estimation

Let y_{eit} be the mean value of the labor market outcome for (native) ethnic group e, in industry i, at time t ($t = q1/1991, q2/1991, ..., q4/2004$). I calculate this outcome per industry-quarter cell separately for each ethnic group (so, theoretically we have $56 \times 15 = 840$ observations for each ethnic group, where 56 is the number of quarter-year points in the investigated

period, and 15 is the number of industries—the 'unknown' category included). I then run the following regression, by ethnic group:

$$y_{eit} = \alpha_e + \beta_e p_{it} + \phi_e f_{it} + \gamma_{0e} educ_{eit} + \gamma_{1e} exp_{eit} + T + I + \varepsilon_{eit} \tag{9}$$

where $educ_{eit}$ and exp_{eit} are, respectively, the average years of schooling and experience of group e in industry i at time t. T and I are vectors of fixed effects indicating the time period (quarter-year) and industry from which the group is drawn. Industry fixed effects are included for two reasons. First, to control for different industry-specific unobservables that can affect the wage or employment of natives. Second, industry groups in my analyses signify different skill-groups, and thus including industry fixed effects controls for general skill differences between the industries.[30] Standard errors are clustered by industry cells.

The error term, ε_{eit}, may include, among other possible demand shifters, the term $d = -\frac{h_e}{1-\delta_e}$, which stands for possible changes in employer discrimination (see footnote number 29). Since this may be correlated with the number of Palestinians employed in Israel, in my analyses I include the variable $Conflict$—which is a count of Israeli-Palestinian conflict events (see Data section for details), to proxy, or partially control, for this term.

Conflict effects of this sort, however, are likely to vary between different industries; for example, the conflict is less likely to affect wages in industries that employ few, or no, Arabs.

[30] See footnote number 28. Note that the interpretation of the coefficients, when industry fixed effects are included, is for the *within*-industry comparisons. For completeness, however, I report results for the *between*-industry comparisons, when no industry fixed effects are included.

Therefore, to capture this variation in effects, I interact the variable $Conflict$ with industry fixed effects and run the following regression:[31]

$$y_{eit} = \alpha_e + \beta_e p_{it} + \phi_e f_{it} + \gamma_{0e} educ_{eit} + \gamma_{1e} exp_{eit} + T + I + I \times Conflict_t + \varepsilon_{eit} \qquad (10)$$

I examine the effect of immigration on two distinct labor market outcomes: wages, and employment. Thus, y_{eit} represents either the log of hourly wage, or a measure of employment. I consider two measures of employment. First, the "employment rate," which is defined by the fraction of weeks worked during the year.[32] The labor force questionnaire asks about the number of weeks (or months, as of 1994) worked *last* year; therefore, I use the question for the following year in this year's regression. That is, $y_{eit} = ER_{ei,t+4}$, where ER_{eit} is the fraction of weeks (months) worked last year—number of weeks (months) worked divided by 52 (12). Alternatively, I use the current employment status as a measure of the employment level; that is, EM_{eit} is equal to the number of employed natives (in ethnic group e, industry i, and time t cell) divided by the native population in this cell.[33] I use a linear probability model to estimate the effect of immigration on the employment of natives.[34]

Wage and employment regressions are estimated by weighted least squares—where, unless

[31] Technically, $Conflict$ main effects will be captured by the time fixed effects, since $Conflict$ varies only with time. Thus, its effect has to be viewed within, rather than between, industries.

[32] Employment rate is defined similarly in Borjas *et al.* (2006).

[33] This is simply the employment rate as it is customarily defined in labor economics.

[34] Qualitatively I get similar results if I estimate employment equations by minimum Chi-square method (grouped logit estimator), when using the right weights in this $FGLS$ type of estimator. Namely, instead of simply using the cell size n, we use $n\hat{E}(1-\hat{E})$, where $\hat{E}$ is the predicted employment rate, calculated from an unweighted first stage regression of log odds ratio on the variables of interest.

otherwise stated, weights are the number of observations used to calculate the dependent variable in each industry-quarter cell. These dependent variables are calculated from the microdata on employment and income using CBS-provided individual sampling weights.[35]

4.2 Instrumental Variables Approach

The decision to immigrate for work is likely to be related to the economic situation in the destination country. This, in turn, is manifested in better employment opportunities and higher wages.[36] Therefore, the portion of Palestinians and foreign workers in the Israeli workforce (variables p_{it} and f_{it} in Equations 9 and 10) may be endogenous; estimating Equations 9 and 10 by OLS, therefore, may result in biased estimators for the main effects of interest.

Using days-under-closure as an instrument for the portion of Palestinians and worker-permits as an instrument for the portion of foreign workers, I estimate the main equations by two-stage-least-squares.

4.2.1 Days Under Closure

Days under closure constitutes a source of independent variation in the number of Palestinians employed in Israel. The number of days under closure is significantly, and negatively, related to the portion of Palestinians employed in Israel. This variable is dictated by secu-

[35] Regularly I found no big difference between the weighted and non-weighted estimates of the second stage.

[36] See Angrist (1996) for a description and estimation of a two-economies model, where Palestinians' choice of joining the Israeli labor market explicitly depends on the relation between local and Israeli wages.

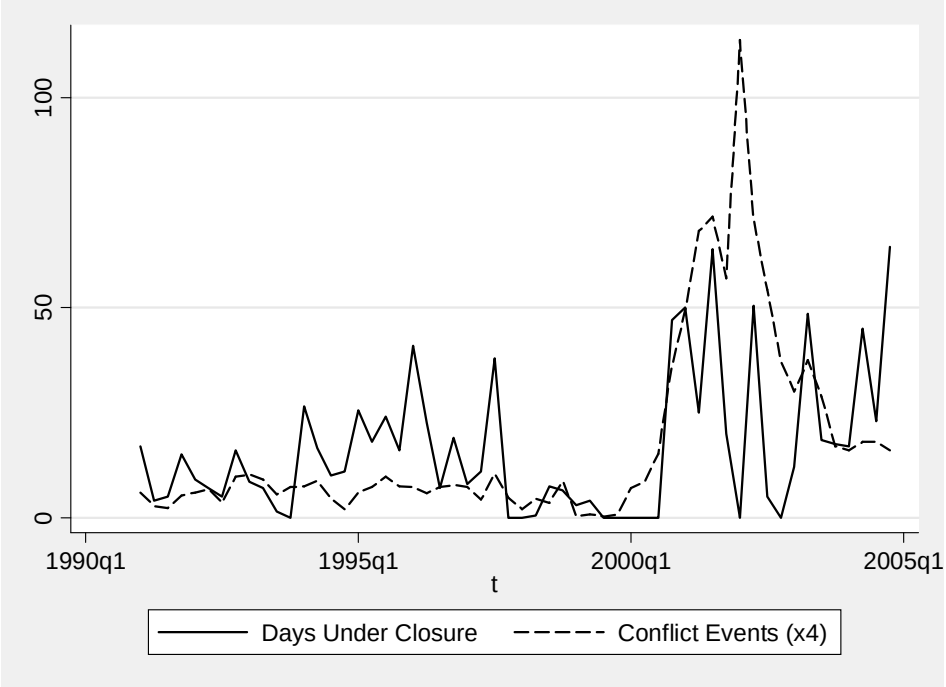

Figure 5: Days Under Closure and Total Conflict Events

rity considerations regardless of the labor market conditions. Since Palestinian workers have huge difficulties arriving at their Israeli workplaces when a closure is imposed, the number of days under closure is a good candidate instrument for the portion of Palestinians employed in Israel. Broadly speaking, a closure is imposed in response to some attack or conflict event, which itself may affect the labor demand in Israel or the supply of Palestinians, so I control for $Conflict$ in my analyses besides using the closure days as an instrument. Figure 5 plots the days under closure data along with the conflict data. A positive relation is clear; also, the intifada incident of September 2000 is apparent in both series of data.

In industry-by-industry regressions which are not shown, of wage on days under closure

and time fixed effects, I find that the coefficient on closures is not significant in industries which do not employ Palestinians, such as banking, education, and health. This is good evidence in favor of the exclusion restrictions, because it suggests that the only channel of correlation between closures and Israeli wages is through the entry of Palestinians.

I performed another validity check of the instrument, to see whether days under closure have an effect on, or are correlated with, the economic situation in Israel. I regressed the composite state-of-the-economy index (which is a synthetic cyclical indicator for examining the direction of real economic activity), on days-under-closure and year and quarter fixed effects.[37] I found no statistically significant relation between days under closure and the state-of-the-economy index. More specifically, the coefficient on closures, if anything, is expected to be negative, but I found it to be insignificantly positive in this regression: 0.0136 with a standard error of 0.0144 ($R^2 = 0.995$, $N = 56$).

Figures 6–8 show the Palestinians-to-Israelis ratio (p_{it}) and the days under closure, in different industries. (Each data point in these graphs is a quarter-year cell.) A negative relationship is apparent from the figures in each industry. The lines in these graphs plot the fitted values from an OLS regression of the Palestinians-to-Israelis ratio on Effective Closure Days. These yield coefficients of -0.003, -0.0003, and -0.007 in the agriculture, manufacturing, and construction industry, respectively; with R^2 of 0.272, 0.225, and 0.261. The correlation

[37] The composite state-of-the-economy index is calculated monthly by the Bank of Israel. The index, and accompanying explanations, can be found on the Bank of Israel's web site, available online from: <http://www.bankisrael.gov.il/deptdata/mehkar/indeng.htm>.

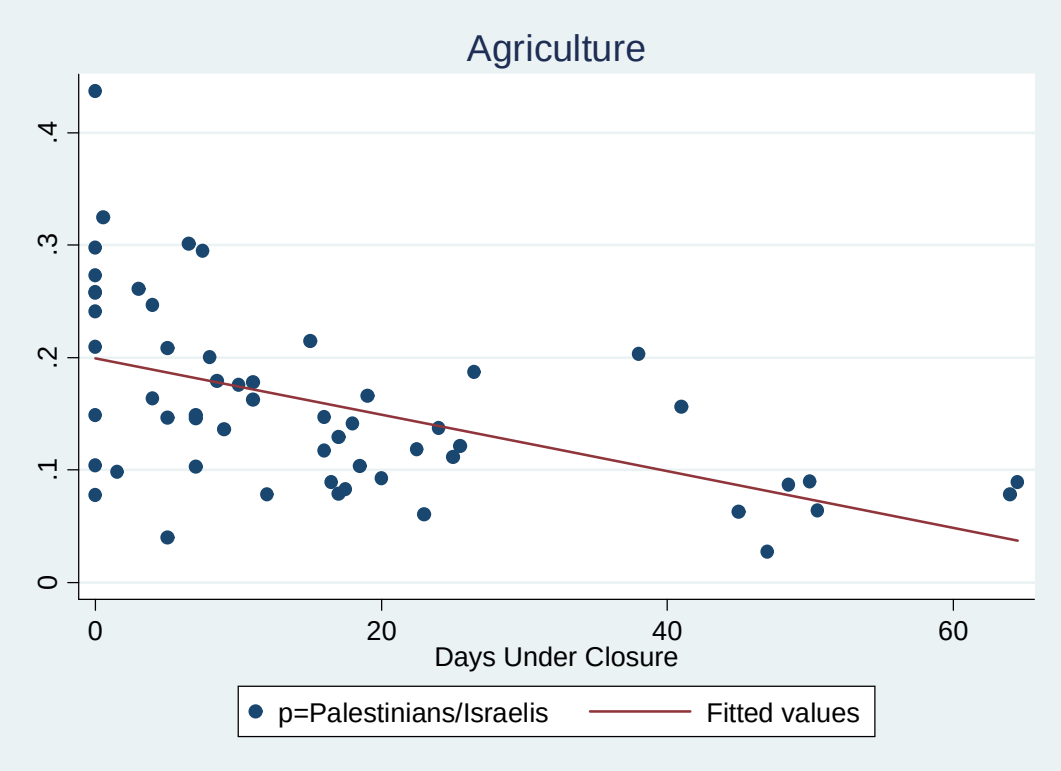

Figure 6: Palestinians-to-Israelis Ratio and Days Under Closure—Agriculture

coefficient between p_{it} and effective-closure-days (ECD_t) is -0.52, -0.47, and -0.51.

4.2.2 Foreign Worker Permits

Foreign worker permits are used as an instrument for the number of foreign workers in Israel. This variable is highly, and positively, correlated with the number (ratio) of foreigners in the Israeli workforce, making it a relevant instrument. The availability of illegal foreign workers and unused permits preclude this from being *perfectly* correlated with the number of foreign workers. On the other hand, the existence of sufficient administrative lags and

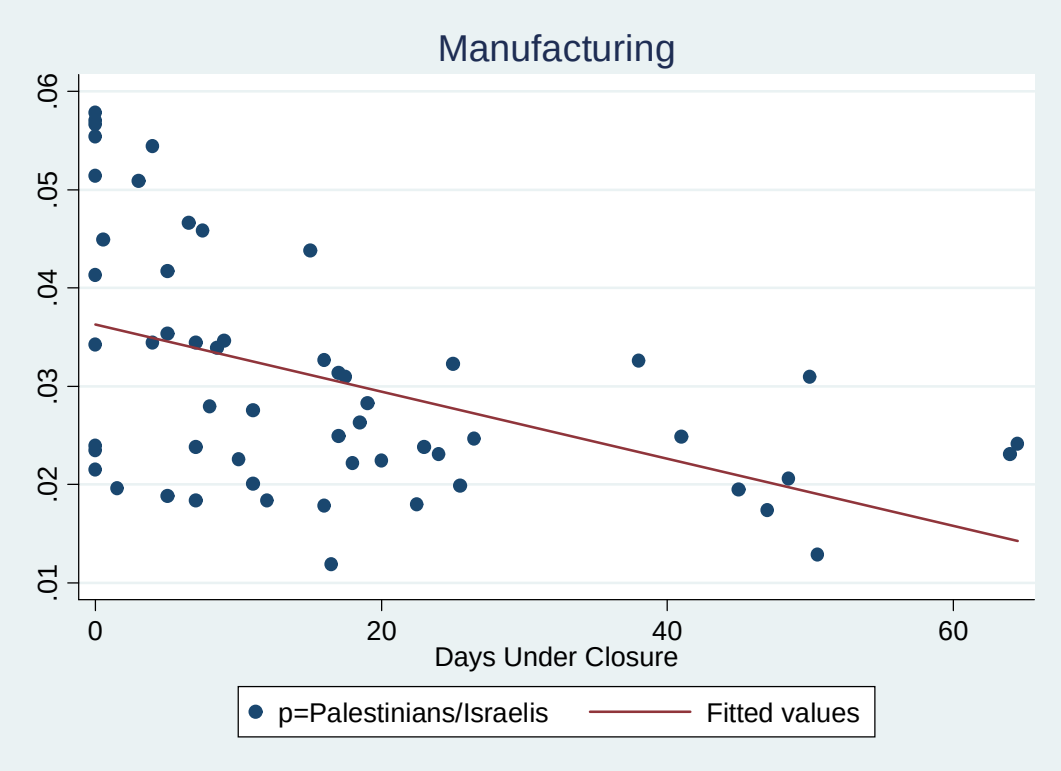

Figure 7: Palestinians-to-Israelis Ratio and Days Under Closure—Manufacturing

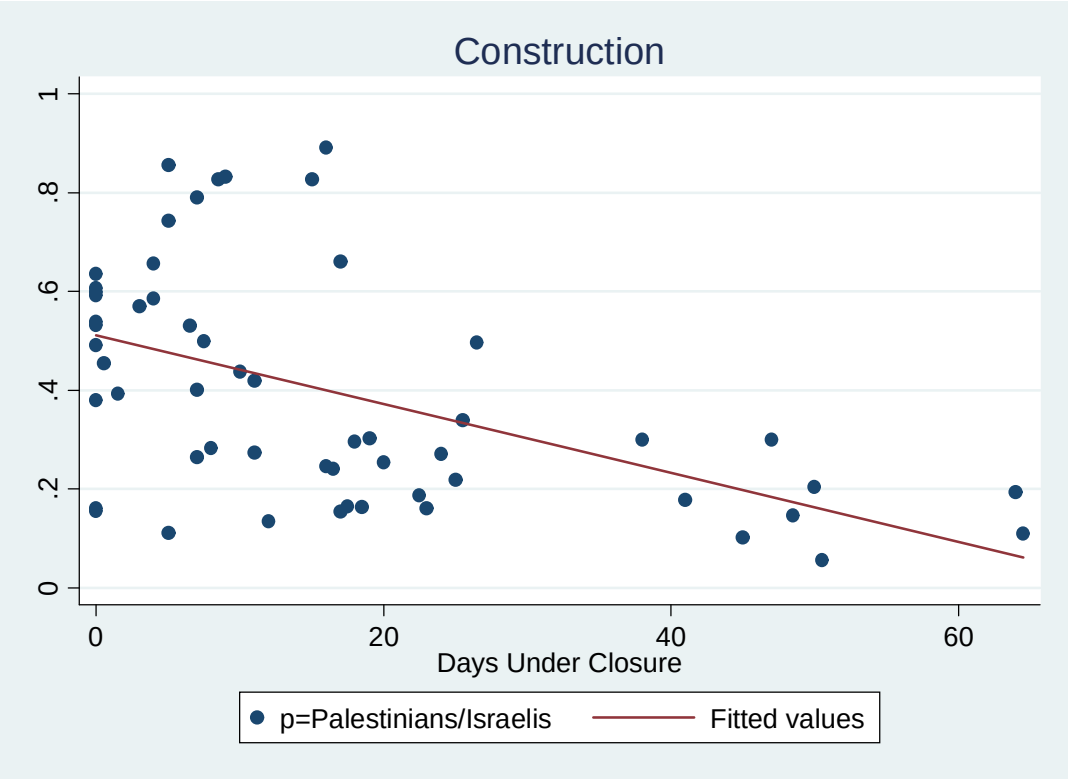

Figure 8: Palestinians-to-Israelis Ratio and Days Under Closure—Construction

inefficiencies in the issuance of permits dissociates it from unobserved or unmodelled current wage and employment determinants. Due to this institutional friction, the worker-permits variable makes a good candidate instrument.[38]

In industry-by-industry reduced form regressions, of wages against worker permits (and time fixed effects), I found that the coefficient on worker-permits is generally not significant in industries which do not employ immigrants. This suggests that the exclusion restrictions—that the only channel of correlation between worker permits and Israeli wages is through the entry of foreign workers—is reasonable.

Moreover, to see whether the number of foreign worker permits is correlated with the economic state of the country, I regressed the composite state-of-the-economy index (see previous section) on worker permits and year and quarter fixed effects. I found no statistically significant relation between worker permits and the state-of-the-economy index. More specifically, the coefficient on permits is not significantly different from zero, it is 0.0042 with a standard error of 0.0294 ($R^2 = 0.994$, $N = 56$).

Finally, while it is possible that worker permits are issued in response to changes in labor demand, evidence does not support this hypothesis. If it, nevertheless, were true we would expect the wage to increase when worker permits, and thus foreign workers, increase; in the Results section, however, we will see that wages actually decrease with foreign workers.

[38] Friedberg and Sauer (2003) use this variable in estimating the effect of foreigners on Palestinians, and provide a similar argument as to its validity. (A more recent version of the paper (June, 2004) is available from:
<http://www.mnb.hu/Resource.aspx?ResourceID=mnbfile&resourcename=sauer4>).

Second, examining the intifada, where in one quarter the number of Palestinians employed in Israel dropped by 84,000 workers, the contemporaneous increase in worker permits was only 6,800 (from 72,600 to 79,400)—and foreign workers increased by 6,500, from 204,500 to 211,000. Even in subsequent quarters the increase in worker permits was never above 10,000, and in 2002 this started *declining*. This suggests that worker permits cannot respond quickly to economic conditions.

Figures 9–11 show the foreigners-to-Israelis ratio (f_{it}) and the number of foreign worker permits issued in different industries. Lines are the fitted OLS values from running f_{it} on permits, with coefficients of 0.005, 0.00009, and 0.005 in agriculture, manufacturing, and construction industry, respectively; with R^2 of 0.653, 0.732, and 0.615. The correlation coefficient between f_{it} and permits is 0.81, 0.86, and 0.78, respectively.

5 Estimation Results

Table 3 reports the underlying first-stage regressions for Palestinian and foreign workers used in the study. The omitted category is banking. The explanatory variables in these regressions include average schooling and experience in each industry, 56 time fixed effects, 15 industry fixed effects, all the instruments (closure days and worker permits) and the instruments interacted with industry fixed effects, and, in the richer specification, the $Conflict$ variable and $Conflict$ interacted with industry fixed effects.

It is apparent from the table that the portion of Palestinians is negatively related to the

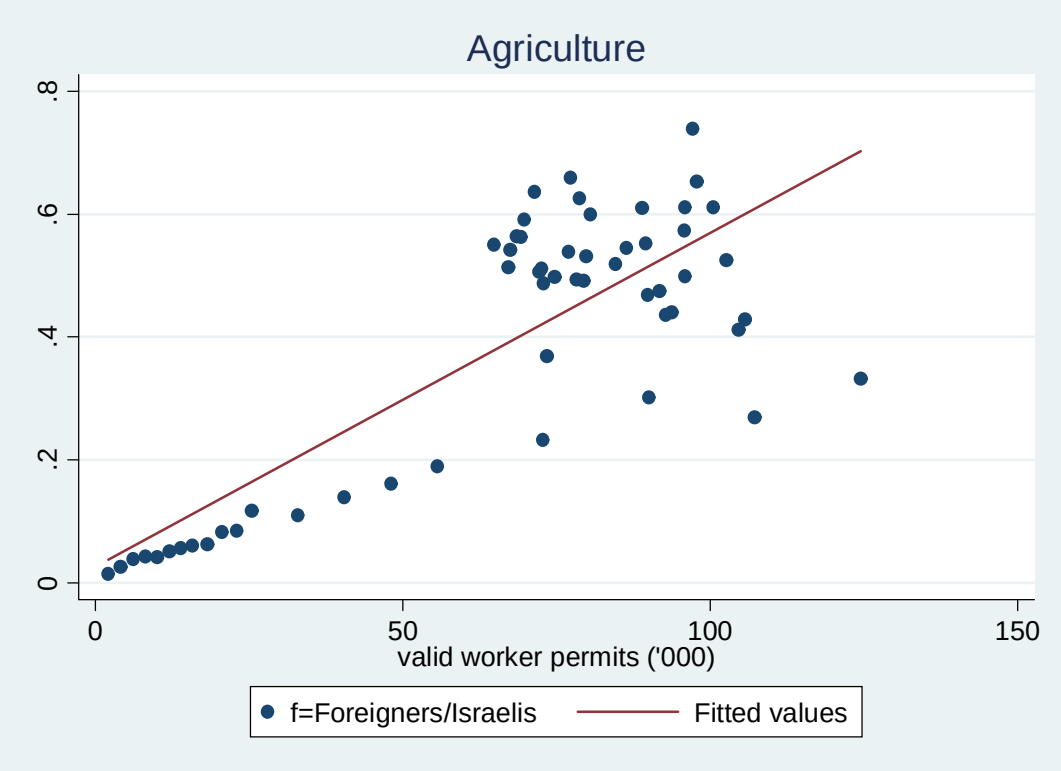

Figure 9: Foreign-Workers-to-Israelis Ratio and Worker Permits—Agriculture

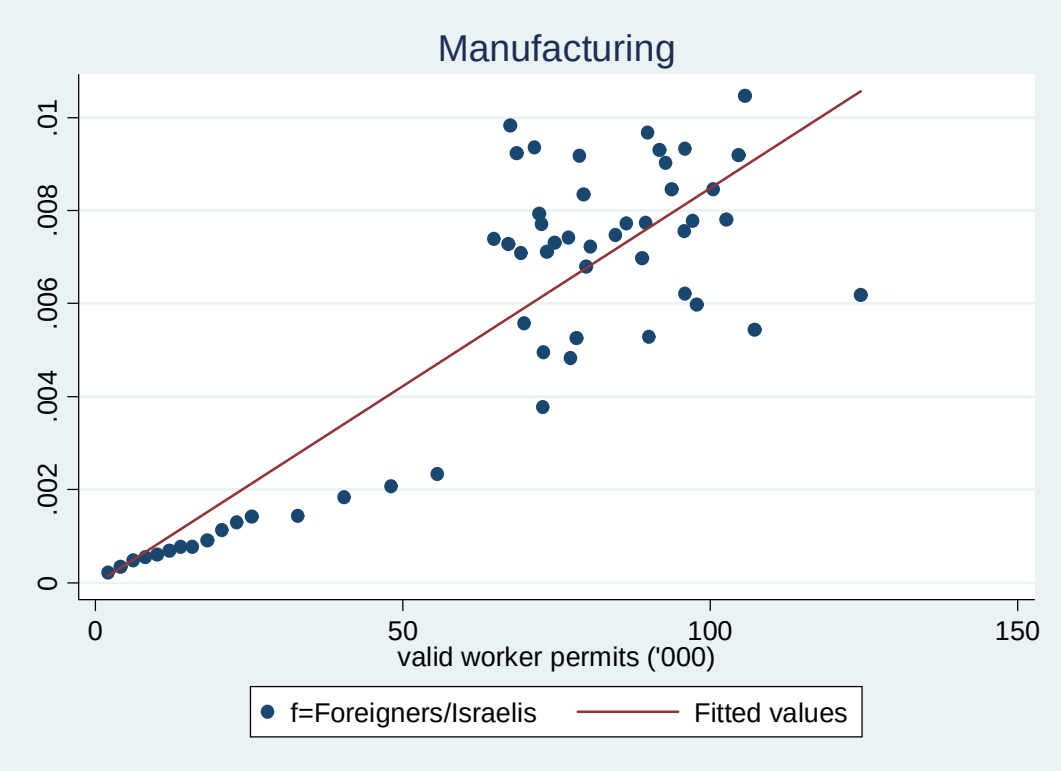

Figure 10: Foreign-Workers-to-Israelis Ratio and Worker Permits—Manufacturing

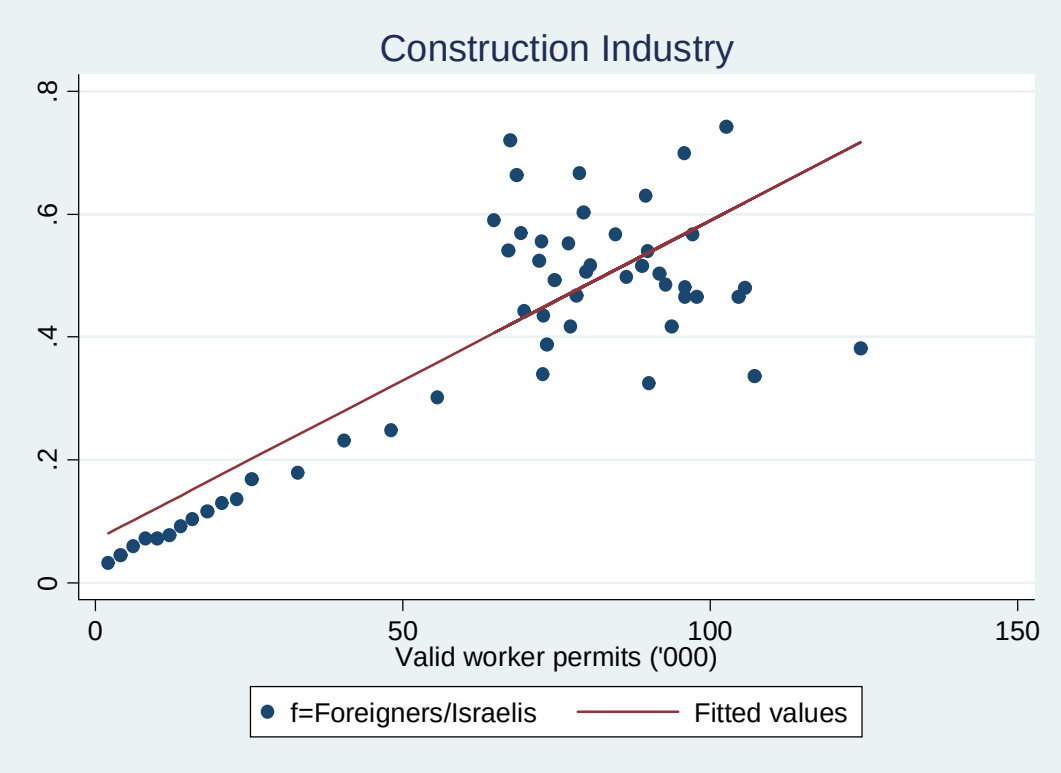

Figure 11: Foreign-Workers-to-Israelis Ratio and Worker Permits—Construction

Table 3: First Stage Regressions

	Palestinians		Foreign Workers	
Variable	Coefficient	SE	Coefficient	SE
Closure	0.49	0.395	0.89	1.892
Closure×Agriculture	-1.94***	0.600	-1.39	2.875
Closure×Manufacturing	-0.31	0.379	-0.05	1.817
Closure×Electricity	0.04	0.575	-0.09	2.760
Closure×Construction	-3.72***	0.410	-2.43	1.966
Closure×Vehicles	-0.21	0.396	-0.03	1.897
Closure×Accommodation	-0.99**	0.464	-2.23	2.226
Closure×Transport	-0.13	0.415	-0.03	1.990
Closure×Real Estate	0.06	0.400	-1.12	1.918
Closure×Public Administration	-0.01	0.412	-0.12	1.974
Closure×Education	0.01	0.431	-0.08	2.066
Closure×Health	0.02	0.456	-0.15	2.189
Closure×Community	-0.06	0.467	-0.18	2.240
Closure×Domestic Personnel	0.07	1.137	30.62***	5.454
Closure×Unknown	-0.26	0.474	-0.08	2.273
Permits	0.00	0.234	-0.63	1.122
Permits×Agriculture	0.28	0.394	4.93***	1.890
Permits×Manufacturing	0.00	0.225	0.12	1.079
Permits×Electricity	0.01	0.346	0.01	1.658
Permits×Construction	-4.02***	0.245	4.48***	1.176
Permits×Vehicles	0.05	0.236	0.37	1.132
Permits×Accommodation	0.01	0.298	5.97***	1.429
Permits×Transport	-0.04	0.251	0.04	1.204
Permits×Real Estate	0.01	0.254	1.88	1.217
Permits×Public Administration	-0.01	0.249	0.02	1.195
Permits×Education	-0.02	0.260	-0.01	1.246
Permits×Health	-0.05	0.276	0.03	1.326
Permits×Community	-0.21	0.295	0.77	1.413
Permits×Domestic Personnel	-0.02	0.669	67.65***	3.208
Permits×Unknown	0.08	0.510	0.28	2.445
R^2	.9137		.8356	

NOTE.— * p<10%, ** p<5%, *** p<1%. Dependent variable for Palestinians (Foreign Workers) is p_{it} (f_{it}), which is the Palestinians- (Foreigners-) to-Israelis ratio in industry i at time t. Independent variables are: days under closure, $closure \times industry$ interaction terms, permits, $permits \times industry$ interaction terms, time fixed effects, industry fixed effects, average schooling in industry, average experience in industry, and $Conflict \times Industry$ interaction terms. Coefficients (and standard errors) are multiplied by 1000, for ease of exposition.

number of days under closure. Also, the portion of foreign workers is generally positively related to the number of foreign worker permits. High R^2 (.84–.91) is an evidence for strong instruments. The strength of the first stage is more pronounced in the "immigrant-abundant" industries; and, in these industries, the effect is very precisely estimated. Finally, both the effect of closure on foreign workers and the effect of worker permits on Palestinians are not always statistically different from zero.

Table 4 reports the main findings of this study, concerning the effect of different types of immigrants on wages of native groups. Foreign workers seem to have negative effects on the wages of Arabs.[39] The wage of Jewish workers is virtually unaffected by foreign workers. Palestinians, nonetheless, while affecting Jewish workers negatively have a *positive* effect on the wage of Arabs. Two possible, not mutually exclusive, explanations for this result are possible. First, Israeli Arabs may benefit from the entry of Palestinians into some industries, because they may be promoted—within that industry—to a position of supervising Palestinian workers, given their better knowledge of Hebrew (and Arabic). Also Israeli Arabs have a clear advantage in transporting Palestinians from border areas to their workplaces in Israel.[40] Second, it may be the case that Arab workers who are crowded out

[39] Note that columns labeled (1) (OLS or IV) in the table do not include industry fixed effects, thus measure the overall, not the within-industry, effect of immigration.

[40] Theory is found to support this hypothesis. Findlay and Lundahl (1987) show how white workers, in the Apartheid South African economy, can *benefit* from the entry of black workers, even if that entry lowers their marginal productivity. So long as there are restrictions on the mobility of blacks, their wage will be lower than their marginal product, and white workers—having 'license to import' black workers—will reap a 'premium' on each black worker entering the economy. The premium is equal to the difference between the marginal product of labor and the wage at the blacks' hometown (the "Bantustan"). The setting in our context is very similar, since the stylized facts are that: Israeli Arabs may be needed for every Palestinian hired to work in Israel—for help in communication and transportation from border areas to the Israeli

Table 4: Effect of Immigration on Wages

	OLS			IV		
	(1)	(2)	(3)	(1)	(2)	(3)
Coefficient on p:[a]						
Arab	.193***	.186***	.205***	.224***	.204***	.246***
	(.039)	(.042)	(.043)	(.049)	(.056)	(.063)
Jewish	−.305**	−.009	−.041	−.346**	−.062	−.090*
	(.138)	(.030)	(.028)	(.155)	(.047)	(.050)
Coefficient on f:[a]						
Arab	−.073***	−.020	−.034*	−.095***	−.102***	−.082***
	(.016)	(.014)	(.019)	(.020)	(.028)	(.025)
Jewish	−.072***	−.003	.0003	−.089***	.001	.004
	(.025)	(.006)	(.007)	(.029)	(.010)	(.011)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	No	Yes	Yes
Conflict×Industry	No	No	Yes	No	No	Yes
R^2 (Arab)	.726	.826	.830	.725	.822	.829
R^2 (Jewish)	.610	.878	.884	.608	.877	.884

NOTE.— * p<10%, ** p<5%, *** p<1%.

[a] $p = Palestinians/Israelis$, $f = Foreigners/Israelis$. FE stands for "Fixed Effects." Dependent variable is the average $ln(wage)$ in each industry-quarter cell. Other independent variables are the average of schooling and the average of experience in each industry-quarter cell, for each ethnic group. Regressions are run separately for each ethnic group, thus, each column represents two regressions, one for Arabs and one for Jews. There are 729 Arab industry-quarter cells (observations), and 833 Jewish industry-quarter cells (observations). Regressions are weighted least squares, where weights are the number of observations used to calculate the dependent variable in each cell. Standard errors are in parentheses, and they are adjusted for clustering within industry cells.

from the industry by the entry of Palestinians are less skilled, thus leaving the highly skilled workers in that particular industry raising the average wage of Arabs.

Analyses at the individual level do not lend support to the selective withdrawal hypothesis. That is, using individual data and controlling for a multitude of worker characteristics (such as schooling, experience, squared experience, marital status (five categories), type of locality, and period of immigration, beside other variables used in the grouped data analyses such as conflict, and time and industry fixed effects), I find the coefficient on p for Arabs

workplaces; and, on the other hand, Palestinians never have free access to the Israeli labor market—and this restriction on their movement keeps their wage much lower than that of other parties in the labor market.

to be positive and significant: 0.236 (standard error 0.053). Had the selective withdrawal hypothesis been the sole explanation for our results, controlling for a wide set of individual characteristics—and thus partially for self selection—would have resulted in a *negative* coefficient, which is clearly not the case here.

Furthermore, I directly compare the average "quality" of the Arab workers before and after the intifada. If there is negative self-selection, then we would expect the quality of Arab workers to decline after the intifada, when less skilled Arabs join the labor market to substitute for the lost Palestinians. I define quality as the weighted average of the characteristics—schooling, experience, experience squared, and marital status—of Arab workers, where for weights I take the Arab (or Jewish) coefficients from a general wage equation run for the whole period of the study. I find that there is no significant change in the quality of Arab workers after the intifada, and, if anything, it increases slightly.[41] This result is in favor of a complementarity explanation for the positive effect of Palestinians on Israeli Arab wages found earlier.

Tables 5 and 6 report results of the employment regressions. In Table 5 the dependent variable is the "employment rate," defined as the portion of weeks worked last year. Since the regressors are of the current year, I calculate the relevant employment rate from the following year's survey. In Table 6 the dependent variable is the average employment in the

[41] Using Arab wage coefficients the "quality" of Arabs increase from 0.940 in the first three quarters of 2000 to 0.953 in the first three quarters of 2001. Using Jewish wage coefficients this increases from 0.863 to 0.876 (the exact change as before). I get similar results when comparing the quarter right before the intifada (quarter 3/2000) with the quarter right after the intifada (quarter 4/2000), and these are 0.953-0.955, and 0.875-0.878 when using the Arab and Jewish wage coefficients, respectively.

Table 5: The Effect of Immigration on the Employment Rate of Natives

	OLS			IV		
	(1)	(2)	(3)	(1)	(2)	(3)
Coefficient on p:[a]						
Arab	.771*	−.107***	−.142***	.878*	−.119***	−.154***
	(.412)	(.010)	(.014)	(.449)	(.013)	(.020)
Jewish	.252	−.028***	−.025**	.228	−.043***	−.050***
	(.287)	(.009)	(.010)	(.311)	(.013)	(.016)
Coefficient on f:[a]						
Arab	.175	.009*	.013*	.194	.021*	.026
	(.147)	(.005)	(.006)	(.173)	(.010)	(.016)
Jewish	.177	.002	.001	.243	−.002	−.005
	(.144)	(.006)	(.007)	(.172)	(.012)	(.014)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	No	Yes	Yes
Conflict×Industry	No	No	Yes	No	No	Yes
R^2 (Arab)	.508	.997	.997	.506	.997	.997
R^2 (Jewish)	.684	.999	.999	.682	.999	.999

NOTE.— * p<10%, ** p<5%, *** p<1%.

[a] $p = Palestinians/Israelis$, $f = Foreigners/Israelis$. Dependent variable is the average employment rate in each industry-quarter cell. Employment rate is defined by the number of weeks (months) worked during the year divided by 52 (12). See text for details. Other independent variables are the average of schooling and the average of experience in each industry-quarter cell, for each ethnic group. Regressions are run separately for each ethnic group, thus, each column represents two regressions, one for Arabs and one for Jews. There are 776 Arab industry-quarter cells (observations), and 780 Jewish industry-quarter cells (observations). Regressions are weighted least squares, where weights are the number of observations used to calculate the dependent variable in each cell. Standard errors are in parentheses, and they are adjusted for clustering within industry cells.

particular industry-quarter cell. This is the portion of people employed from the whole pool of natives in that cell. These tables are based on calculations from the labor force data—thus, they are different from data used in the wage analyses which come from the income survey. See the data section for details.

Results from these tables (5 and 6) are very similar. Palestinians seem to crowd out both Arabs and Jews. The effect of foreign workers on the employment opportunities of natives is not always significantly different from zero; this could be because it is possible that permits

Table 6: The Effect of Immigration on the Employment of Natives

	OLS			IV		
	(1)	(2)	(3)	(1)	(2)	(3)
Coefficient on p:[a]						
Arab	.781*	−.097***	−.128***	.886*	−.093***	−.120***
	(.426)	(.011)	(.010)	(.458)	(.007)	(.010)
Jewish	.260	−.041***	−.042***	.240	−.028**	−.028*
	(.285)	(.008)	(.006)	(.321)	(.012)	(.011)
Coefficient on f:[a]						
Arab	.175	−.007	−.007	.213	.006**	.005
	(.158)	(.014)	(.014)	(.196)	(.002)	(.004)
Jewish	.179	−.007	−.012	.247	−.011	−.020
	(.144)	(.007)	(.007)	(.175)	(.009)	(.012)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	Yes	No	Yes	Yes
Conflict×Industry	No	No	Yes	No	No	Yes
R^2 (Arab)	.491	.996	.996	.489	.996	.996
R^2 (Jewish)	.073	.999	.999	.072	.999	.999

NOTE.— * p<10%, ** p<5%, *** p<1%.

[a] $p = Palestinians/Israelis$, $f = Foreigners/Israelis$. Dependent variable is the probability of being employed (average employment in an industry-quarter cell). Other independent variables are the average of schooling and the average of experience in each industry-quarter cell, for each ethnic group. Regressions are run separately for each ethnic group, thus, each column represents two regressions, one for Arabs and one for Jews. There are 836 Arab industry-quarter cells (observations), and 840 Jewish industry-quarter cells (observations). Regressions are weighted least squares, where weights are the number of observations used to calculate the dependent variable in each cell. Standard errors are in parentheses, and they are adjusted for clustering within industry cells.

increase when demand shifts out, but the decrease in Arab wages suggests that this is not the explanation. Foreign-worker-induced supply shocks, therefore, do not seem to be explaining changes in employment gaps among natives.

5.1 Alternative Explanations

It is possible that, when restrictions are imposed on the movement of Palestinian workers, those are also imposed on the movements of goods. Thus, exports from Israel to the Palestinian territories may decrease with the number of Palestinian workers.[42] If this is true for industries which employ Israeli Arabs, then, when Palestinians are barred from entering the country, the demand for these workers may decrease as well, resulting in lower wages for Arabs, even in the absence of complementarity between Israeli Arabs and Palestinian workers.

Although it is a possible explanation for the observed positive relation between Palestinians and the wage of Israeli Arabs, the evidence does not support this alternative explanation. First, using CBS figures about total exports from Israel to the WBGS, I estimate the main wage equations with the exports, interacted with industry, added as a regressor. The results are only slightly affected, and the positive relation between Arab wages and the portion of Palestinians is maintained. In a new regression which includes exports to WBGS interacted

[42] Using the 56 quarters at hand, I find that the correlation coefficient between total exports to the Palestinian territories and the (aggregate) number of Palestinians employed in Israel is 0.136. A positive but small coefficient.

with industry fixed effects, I still find a positive and significant effect of Palestinians on the wage of Israeli Arabs—more specifically, the analogous Arab coefficient on p to that (.205) found in first row, column (3) of Table 4 is now 0.154 (Pv.<0.01).[43] All other specifications yield similar results.

Approached differently, if restrictions on Palestinian movement affect wages by decreasing Israeli exports (to the WBGS), then there will be no Israeli Arab wages in industries which produce non-tradable goods. Therefore, I estimate the main wage equations in a subsample which includes only non-tradables and services: construction, accommodation services, real estate and business activities, and domestic personnel in private households. Despite a much smaller sample, the coefficient on p (Palestinians/Israelis ratio) for Arabs is 0.141 (with standard error of .0827).[44] This evidence is at odds with the exports explanation.

Finally, an exports explanation implies that the employment rate of Arabs should *increase* when there are more Palestinians employed in Israel. Previous tables (such as Table 5 and 6) show that the employment rate of Arabs, within industry, *decreases* with the increase of Palestinians in that industry, in contrast to what the exports explanation would predict.

[43] The coefficient for Jewish workers is now a statistically significant -.054 (as compared to the insignificant -.041 from second row, column 3 of Table 4.

[44] These regressions include year fixed effects (rather than t fixed effects), average experience, average schooling, conflict interacted with industry fixed effects. The coefficient on p for Jewish workers is -.020 and not significant (standard error is 0.054).

6 The Intifada as a Natural Experiment

The second intifada (referring to the Palestinian uprising against the Israeli occupation) started on September 30, 2000 (the first intifada started in 1987). That is exactly the last day of the third quarter of the year 2000.[45] As a result of the intifada, and in less than a couple of months, the number of Palestinian workers in Israel dropped dramatically, from 121,000 workers in the end of the third quarter of 2000, to about 37,000 workers in the next (fourth) quarter of 2000 (a drop of 84,000 workers, which is about 6.9% of the Israeli, male workforce).[46]

This dramatic change in the number of Palestinian workers, a result of political tension, constitutes a natural experiment—where the number of "immigrants" changes exogenously, and for reasons clearly outside the labor market. In the previous section I find different effects of Palestinians and foreign workers using an instrumental variables approach. The intifada event study allows us to see the effect of Palestinians not confounded by that of foreign workers—between the third and fourth quarter of 2000 the number of foreign workers, which was on the rise during that period, only increased by 7,000 workers (a 3% increase). Hence, the before-after comparison allows us to safely assume the number of foreign workers to be

[45] This is important because my data are quarterly, and therefore I have data on the labor market right before and right after the intifada.

[46] In his seminal paper, Card (1990), studies a very similar "natural experiment." The Mariel Boatlift of 1980, investigated by Card, increased the Miami labor force by 7% in less than four months. Card (1990) found virtually no effect of this immigration wave on the wages or unemployment rates of less-skilled workers. The intifada in this paper is a "reverse boatlift," in that the number of immigrants dropped (rather than increased) sharply.

roughly constant, and thus associate any effects on the labor market with the lost Palestinian workers.[47] I run the following regression:

$$y_{je} = \alpha_e + X_{je}\beta_e + \gamma_{0e}INT + \gamma_{1e}PAL + \gamma_{2e}INT \times PAL + u_{je} \tag{11}$$

where y_{je} is the outcome variable ($\ln(wage)$ or dummy for employment status—1 if employed, and zero otherwise) of individual j of ethnic group e. The regressions use individual data, and control for marital status, type of locality, schooling, experience, squared-experience, and period of immigration.[48] INT in these regressions is a categorical variable which takes on the value 1 if the individual is observed after the intifada and 0 otherwise, PAL is a categorical variable which takes on the value 1 if the individual is employed in an industry that typically employs Palestinians, and 0 otherwise. The "treatment" is the intifada (resulting in the huge drop of Palestinian workers), and the "treated" are workers who are likely to be affected by the treatment, namely, workers in industries which employ Palestinians—and thus experienced a loss in workers. Those industries are labeled PAL, and include: agriculture, construction, manufacturing, vehicles repair and maintenance, accommodation and restaurants, business services, transport, and personal and social services.

Table 7 presents difference-in-differences estimates of the effect of Palestinians on labor

[47] Other comparison period that I make is grouping the first, second, and third quarter of 2000 (this is the before-treatment group) and the first, second, and third quarter of 2001 (the after-treatment group). The fourth quarter of 2000—where the *intifada* started and was at its peak—being skipped. These time periods grouped are comparable in terms of seasonality, facilitating the estimation of the effect.

[48] Control for period of immigration is only in the wage equation.

market outcomes of Israeli Arabs and Jews.[49] The intifada has a statistically significant negative effect on the wages of Arabs only. Industries that employ Palestinians have generally lower wages—and more so for Arabs. But Jewish workers, employed in these industries, seem to benefit more from the intifada-induced shortage of Palestinians (the net effect on their wage is 0.049 (=.057-.008) as opposed to 0.026 for Arabs, in the first set of periods of comparison). The Difference-in-Difference-in-Differences (DDD) estimate is $0.026 - 0.049 = -0.023$, that is, Arab wages, in the immigrant-employing industries, are harmed, relative to Jewish wages, by the exit of Palestinians (due to the intifada). In the 3/00-4/00 comparison (column (2) of the table) the figures are 0.026 for Jews and 0.003 for Arabs, therefore the DDD estimate is exactly -0.023, equal to that from column (1).

To see how this estimate compares to previous results, consider the estimates from column (3) of Table 4. The DDD estimate of the effect of p (Palestinians-Israelis ratio) is then: $0.246 - (-0.090) = 0.336$ (*increase* in $\ln wage$ of Arabs relative to Jews, for a one unit increase in p). The DDD estimate of -0.023 from Table 7 is associated with a *decrease* (due to the intifada) in p from $118.5/986.7 = 0.120$ before the intifada to $46.8/973.1 = 0.048$ after the intifada, a decrease of 0.072. Therefore, the relative effect of a one unit increase in p on $\ln wage$ is: $\frac{-0.023}{-0.072} = 0.319$, which is very similar, in sign and magnitude, to the 0.336 estimate mentioned above (which is based on Table 4).

[49] Column (1) of the table uses data from the first three quarters of 2000 and the first three quarters of 2001; column (2) uses only the quarter before the intifada (q3/2000) and the quarter directly after it started (q4/2000). See table notes for more details.

Table 7: The Effect of Palestinians—intifada—on Employment and Wages of Natives

	(1)		(2)	
	Arab	Jewish	Arab	Jewish
Wage:				
INT	$-.090^{**}$	$-.008$	$-.082^{***}$	$.004$
	(.036)	(.018)	(.007)	(.003)
PAL	$-.317^{***}$	$-.114^{***}$	$-.382^{***}$	$-.130^{***}$
	(.035)	(.017)	(.006)	(.002)
$INT \times PAL$	$.116^{***}$	$.057^{**}$	$.085^{***}$	$.022^{***}$
	(.043)	(.023)	(.008)	(.003)
R^2	.382	.331	.347	.326
N	1791	8709	603	3002
Employment:				
INT	$.033^{**}$	$-.0003$	$.026$	$.010$
	(.011)	(.005)	(.017)	(.009)
PAL	$.653^{***}$	$.499^{***}$	$.652^{***}$	$.518^{***}$
	(.010)	(.005)	(.016)	(.008)
$INT \times PAL$	$-.016$	$-.007$	$-.047^{**}$	$-.023^{**}$
	(.013)	(.007)	(.022)	(.011)
R^2	.506	.462	.501	.468
N	11545	45531	3911	15429

NOTE.— * p<10%, ** p<5%, *** p<1%. Column (1) is based on data from quarters 1, 2, and 3 of 2000 and quarters 1, 2, and 3 of 2001. Column (2) is based on data from quarter 3-2000 (just before the intifada) and quarter 4-2000 (just after the intifada started). The variable INT takes on the value 1 if the individual is observed after the intifada, that is, starting from quarter 4 of 2000. PAL takes on the value 1 if the individual is employed in industry which employs Palestinians—such as construction, agriculture, manufacturing, etc. (see text for details). Dependent variable in Wage is $ln(wage)$, and in Employment is employment status (1 if fully or partially employed and 0 if unemployed or not in the labor force). Other independent variables are: marital status, years of schooling, experience, experience squared, type of locality, period of immigration. Standard errors are in parentheses.

The evidence presented by this exercise supports the hypothesis of complementarity between Palestinians and Israeli Arabs. Finally, employment opportunities, after the intifada, are better in general—and more so for Arabs. However, the evidence is somewhat inconclusive about the effect of Palestinians on Arab employment. The DDD estimate in column (1) is 0.024, implying that Arabs are more likely to be employed in immigrant-abundant industries after the loss of Palestinian workers (intifada). The DDD estimate from column (2), nonetheless, is -0.008, meaning the employability of Arabs is unaffected by the intifada. Hence, the effect is either zero or positive.

7 Simulation: Accounting for the Trend Gap in Wages and Employment Between Israeli-Arabs and Jews

As a starting point, I measure the actual difference in the wage and employment gap between the years 1991 and 1999, by industry. Industries are grouped into two types: industries that do *not* employ immigrants, and those in which immigrants are employed (that is, industries i for which $f_{it} + p_{it} > 0$ for some t). The overall effect of immigration is roughly measured by a simple comparison between changes in the gap. Table 8 provides the difference-in-differences estimates. The wage gap in the immigrant-employing industries increased by 0.112 log points *more than* the wage gap in other non-immigrant industries. This may suggest that immigration had a bigger negative effect on the wages of Arabs. The two

Table 8: Overall Effect of Immigration on the Wage and Employment Gap

	Difference in the Gap=$Gap^{99} - Gap^{91}$		
Type of Industry:	ln($wage$)	Employment	Employment Rate
Employing Immigrants	.2020	0.0110	0.0276
No Immigrants	.0902	0.0146	0.0312
Difference	.1118	−.0036	−.0036

NOTE.— Reported are actual changes in the wage, employment, and employment rate gaps, between the years 1999 and 1991. Wage and employment gaps are calculated using sample weights provided by CBS in the data. Changes in wage gaps are calculated from the income surveys, and changes in employment gaps are calculated using the labor force survey files. Samples include men, aged 18–64 only. Industries, in our samples, that do not employ either Palestinians or foreigners are: Electricity, Health, Education, Banking, Public Administration, and the "unkonwn" cateogry.

measures of employment yielded identical results as to the overall effect of immigration, and the effect, while slightly negative, is not significantly different from zero. Therefore, we would expect that immigration explained part of the diverging wage gap, but none of the change in the employment gap.

To more precisely estimate the effect of immigration-induced supply shocks on the wage gap among natives, I use the IV coefficients reported in model (3) of Table 4, and simulate the impact of the Palestinian and foreign worker influxes of the 1990s. I compare changes in the wage gap between 1991 and 1999, by industry. The predicted change in ethnic group e's wages in industry i, due to changes in the portion of foreigners and Palestinians, other things equal, according to Equation 9, is: $dy_{ei} = \beta_e dp_i + \phi_e df_i$, $e = Arab, Jewish$. Therefore, the change in the wage *gap* between two time periods, say 1991 and 1999, due to immigration is given by $(y_J^{99} - y_A^{99}) - (y_J^{91} - y_J^{91})$ or, rearranged, $dy_J - dy_A$, which can be written as:

$$\Delta Gap_i = (\beta_J - \beta_A) \times \left(p_i^{99} - p_i^{91}\right) + (\phi_J - \phi_A) \times \left(f_i^{99} - f_i^{91}\right) \tag{12}$$

Table 9: Wage Gap Simulation 1991/1999

	Change in (log) wage Gap 91/99				
		Predict by Immigrant Workers			Explained by
	Actual	Palestinians	Foreigners	Total	Immigration
Agriculture	-.112	-.024	.043	.018	-16.3%
Manufacturing	.251	-.006	.001	-.005	-2.0%
Construction	.366	.050	.041	.091	25.0%
Vehicles repair	-.050	-.005	.004	-.00004	0.1%
Accommodation-Rest.	.103	-.004	.055	.051	49.8%
Transportation	.209	.007	0	.007	3.2%
Business Activities	.251	.001	.022	.023	9.3%
Community/Other	.174	.008	.006	.014	8.2%
Private households	-.784	0	.365	.365	-46.5%
Other Industries	.090	0	0	0	0

NOTE.— The simulation compares the year 1991 to 1999. The actual change in the wage gap is simply the difference between the wage gap in 1999 and the wage gap in 1991, calculated separately for each industry. Estimates for the simulation are taken from column IV(3) of Table 4. The predicted change in the wage gap is decomposed into two components: the effect of Palestinians $(\beta_J - \beta_A) \times \left(p^{99} - p^{91}\right)$, and the effect of foreign workers $(\phi_J - \phi_A) \times \left(f^{99} - f^{91}\right)$. Last column is simply the total predicted change in the gap over the actual change in the gap.

I then calculated the predicted changes in the gaps within each industry, according to Equation 12, and the actual change in the gap. The portion of the *change* in the wage gap which is explained by immigration is defined by the fraction of the predicted change over the actual change. Table 9 reports the results of this simulation. First, it is evident from the table that immigration explains a good portion of the change in wage gaps in construction and in the accommodation-restaurants industries. These industries employ immigrants more than average.[50]

Immigration, however, does not explain much of the change in the wage gaps in agricul-

[50]The "private households (with domestic personnel)" is reported just for completeness. However, it is clear that results here are erroneous. This becomes clear when we know that in 1991, in our income survey sample, there was only *one* Arab who reported working in this industry with positive income (and when weighted by sample weights this translates to 48 Arabs from the *whole* country). So, it does not make much sense to calculate wage gap within this cell, for that year. It is truly said that this industry is whole-foreigners, since no Palestinians, and almost no Israelis, are employed in this industry.

ture and manufacturing; this is surprising, given that the ratio of foreigners in this industry increased from 0.03 in 1991 to 0.53 in 1999 (similar to the change in the construction industry). The decline in the wage gap in agriculture may be the reason for that, since it goes in the opposite direction to most other industries. It is also clear that we cannot expect immigration to explain changes in wage gaps in industries that do not employ immigrants—those were grouped together in the bottom line of the table. The gross wage gap increased by 0.09 log point in these industries, while the portion of foreigners or Palestinians employed here remained zero.

To see how much of the *overall* change in the wage gap is explained by immigrants, I weighted the predicted change in each industry by the average distribution of industries in 1991 and 1999. Then I divided that by the weighted actual change in the gap. I found that immigration could explain only 7.6% of the overall change in the wage gap. And, if other industries are excluded, immigration could explain about 10.7% of the total change in wage gap in the immigrant-employing industries.[51]

Table 10 reports results for the employment gap simulation (using average employment rather than the employment rate). The overall picture is that immigration provide no explanation for the change in employment gaps. The overall average in immigrant-employing industries is about -25%, that is, using our estimated coefficients the employment gap would have been expected to decrease, but in reality it increased.

[51] Other industries are electricity, banking, public administration, education, and health.

Table 10: Employment Gap Simulation 1991/1999

	Change in Average Employment 91/99				
		Predict by Immigrant Workers			Explained by
	Actual	Palestinians	Foreigners	Total	Immigration
Agriculture	.021	.005	-.008	-.004	-18.0%
Manufacturing	.002	.001	.000	.001	55.3%
Construction	.067	-.010	-.008	-.018	-26.7%
Vehicles repair	-.034	.001	-.001	.000	0.0%
Accommodation-Rest.	-.084	.001	-.011	-.010	12.0%
Transportation	-.026	-.001	0	-.001	5.1%
Business Activities	.068	.000	-.004	-.005	-6.8%
Community/Other	.057	-.002	-.001	-.003	-4.9%
Private households	-.021	0	-.072	-.072	351.9%
Other Industries	.015	0	0	0	0

NOTE.— The simulation compares the year 1991 to 1999. The actual change in the employment gap is simply the difference between the employment gap in 1999 and the employment gap in 1991, calculated separately for each industry. Estimates for the simulation are taken from column IV(2) of Table 6. The predicted change in the employment gap is decomposed into two components: the effect of Palestinians $(\beta_J - \beta_A) \times \left(p^{99} - p^{91}\right)$, and the effect of foreign workers $(\phi_J - \phi_A) \times \left(f^{99} - f^{91}\right)$. Last column is simply the total predicted change in the gap over the actual change in the gap.

8 Concluding Remarks

The second intifada provides a natural experiment for the study of the effect of immigration on labor market outcomes of natives. I exploit this and other recurring labor supply shocks due to border closures to measure the effect of immigration, of Palestinians and foreign workers, on the wage and employment of Israeli Arabs and Jews. The study uses Israeli microdata drawn from labor force and income surveys for the years 1991–2004, to answer questions about the effect of immigration on the Israeli labor market.

A contribution relative to the previous literature is that I examine the effects of different types of immigrants, some of whom are substitutes for the disadvantaged group in the labor market (Israeli Arabs) and the other of whom are complements. I also examine the direct

effect of immigration on labor market disparities between Israeli Arabs and Jews.

While immigration is found to have some interesting effects on different native groups, it could only explain a small portion of the increasing wage gap, and none of the employment gap. The study finds that immigration can explain about 7.6% of the overall change in the wage gap (although it could explain up to 50% of the change in the wage gap within specific industries such as the accommodation-restaurants industry), and it has no explanatory power for the overall change in the employment gap, although within some industries it could explain some of the diverging employment gap (as in the manufacturing industry, for example). This leaves unsolved the puzzle of the diverging gaps of the 1990s. Put differently, it is likely that we would have witnessed the same divergence in labor market outcomes between Israeli Arab and Jewish workers, even if there had been no Palestinian or foreign workers influx in the 1990s.

I find that immigrants had a significant effect on labor market outcomes of natives, and that effects on employment and wages differ in important ways. More importantly, the effects of immigration vary depending on who the immigrants are, and what natives one examines. More specifically, a 10% Palestinian-induced increase in the supply in a particular industry *decreases* the hourly wage of Jewish workers by about 0.9%, but *increases* the hourly wage of Arab workers by about 2.5% in that industry; the employment rate of Jewish workers decreases by 0.5% and that of Arab workers decreases by 1.5%. A 10% Foreign-workers-induced increase in the supply in a particular industry decreases the wage of Arabs by 0.8%

in that industry, but does not affect the wages of Jewish workers, neither does it affect the employment rate of either Arab or Jewish workers.

(Chapter head:)

A Data

In 1995 the Arab sample within the income survey was extended to include Arabs in urban localities with population of 2,000-10,000. (Only urban localities are included in the income survey.) This has no effect on the results and the variables—that is, a jump in the variables of interest is not noticed around this year, and CBS sample weights ensures equal representation of the subgroups, not altered by the extension of the sample.

Since 1997 income has been calculated based on a combined sample of the income survey and the survey of family expenditures. This resulted in income samples double in size—with no apparent effect on our results, given that I use the CBS-provided sample weights everywhere in the analyses. (Kibbutzim, institutions, and groups of Bedouins living outside localities are still absent from the income surveys, even in the new design.)[52]

Worker's hourly wage is calculated by dividing monthly income by the product of hours worked per week and working weeks per month. I deal with outliers, in terms of hourly wage, by dropping observations below the first and above the ninety-ninth percentile of the hourly

[52]The dataset for the year 1997, serving as the linking year, has been produced in two versions pertaining to the old and new sample design. Sample weights, provided in the data files by CBS, serve to make statistical inference comparable over the years.

wage distribution for each year. This procedure is more robust and meaningful than dropping observations on an a priori imposed currency cutoff point, since the analyses involve different years, from 1991 to 2004, over which the currency value is not comparable. Moreover, this procedure accommodates changes in the wage distribution over the period years.[53]

I control for the period of arrival to Israel of permanent Jewish immigrants (from the former Soviet Union and other countries). Not all the income surveys provide exact year of immigration, thus I control for period of immigration—rather than the exact year—that is, immigration in the 1980s versus the 1990s.[54]

B Equilibrium Wage and Employment Derivation

Equating Equations 1 and 2 yields the following:

$$N_{ehi} = \left(\frac{X_{fi}\left(1-\delta_e\right)}{X_{ehi}} \right)^{1/\eta_{eh}} L_{fi}^{\eta_f/\eta_{eh}} = g\left(x_{ei}, L_{fi}\right) \tag{13}$$

[53] See Chandra (2000), where he explains and uses this procedure.

[54] In this study I treat foreign and Palestinian workers as 'immigrants.' I do not investigate the effect of the Russian immigration wave (1990–1993) on the labor market. Those enter my analyses as Jewish workers, with 'foreign-born' dummy. (For the effects of the early Russian immigration see Friedberg (2001).)

where $x_{ei} = \frac{X_{fi}(1-\delta_e)}{X_{ehi}}$. The partial derivatives of g are: $\frac{\partial g\left(x_{ei},L_{fi}\right)}{\partial x_{ei}} = \frac{g\left(x_{ei},L_{fi}\right)}{\eta_{eh}x_{ei}}$, and $\frac{\partial g\left(x_{ei},L_{fi}\right)}{\partial L_{fi}} = \frac{\eta_f}{\eta_{eh}}\frac{g\left(x_{ei},L_{fi}\right)}{L_{fi}}$. The first order Taylor approximation, at the arbitrary point $\left(x^*_{ei}, L^*_{fi}\right)$ is:[55]

$$\begin{aligned} g\left(x_{ei},L_{fi}\right) &= g^*\left(x_{ei},L_{fi}\right) + \frac{g^*\left(x_{ei},L_{fi}\right)}{\eta_{eh}x^*_{ei}}\left(x_{ei}-x^*_{ei}\right) + \frac{\eta_f}{\eta_{eh}}\frac{g^*\left(x_{ei},L_{fi}\right)}{L^*_{fi}}\left(L_{fi}-L^*_{fi}\right) = \\ &= g^*\left(x_{ei},L_{fi}\right)\left(1-\frac{1}{\eta_{eh}}-\frac{\eta_f}{\eta_{eh}}\right) + \frac{g^*\left(x_{ei},L_{fi}\right)}{\eta_{eh}x^*_{ei}}x_{ei} + \frac{\eta_f}{\eta_{eh}}\frac{g^*\left(x_{ei},L_{fi}\right)}{L^*_{fi}}L_{fi} = \\ &= \alpha_{ei} + \beta_e L_{fi} \end{aligned} \tag{14}$$

where $\alpha_{ei} = g^*\left(x_{ei},L_{fi}\right)\left(1-\frac{1}{\eta_{eh}}-\frac{\eta_f}{\eta_{eh}}\right) + \frac{g^*\left(x_{ei},L_{fi}\right)}{\eta_{eh}x^*_{ei}}x_{ei}$, and $\beta_e = \frac{\eta_f}{\eta_{eh}}\frac{g^*\left(x_{ei},L_{fi}\right)}{L^*_{fi}}$

Recall that $L_{fi} = N_{Afi} + N_{Jfi}$, and $N_e = N_{ef} + N_{eh}$, $e = A, J$. Also, $N_f = \sum_{i=1}^{I} L_{fi}$, and thus $\bar{L}_f = \bar{N}_f$. Using the linear approximation in 14, L_{fi} is defined as

$$\begin{aligned} L_{fi} &= \left(N_{Ai} - N_{Ahi}\right) + \left(N_{Ji} - N_{Jhi}\right) = \\ &= N_{Ai} + N_{Ji} - \alpha_{Ai} - \alpha_{Ji} - \left(\beta_A + \beta_J\right)L_{fi}, \end{aligned} \tag{15}$$

and thus:

$$L_{fi} = \frac{N_{Ai} + N_{Ji} - \alpha_{Ai} - \alpha_{Ji}}{1 + \beta_A + \beta_J}. \tag{16}$$

Recall that $g^*_e\left(x_{ei},L_{fi}\right) = \bar{N}_{eh}$ $(e = A, J)$. Using the point of pre-immigration averages as the arbitrary point, and using the definitions of α and β as above, L_{fi} can be expressed

[55] Hereafter, I choose the point of pre-immigration averages as the arbitrary point. That is, $\left(x^*_{ei}, L^*_{fi}\right) = \left(\bar{x}_e, \bar{L}_f\right)$, where $\bar{x}_e = \frac{1}{I}\sum_{i=1}^{I}\frac{(1-\delta_e)X^*_{fi}}{X^*_{ehi}}$ and $\bar{L}_f = \frac{1}{I}\sum_{i=1}^{I}N^*_{fi}$, where asterisks here refer to the pre-immigration values of the variables.

as:

$$L_{fi} = \alpha_i + \rho \left(N_{Ai} + N_{Ji} \right) \tag{17}$$

where $\alpha_i = -\rho \left(\alpha_{Ai} + \alpha_{Ji} \right)$ and

$$\rho = \frac{\bar{N}_f}{\bar{N}_f + \frac{\eta_f}{\eta_{Ah}} \bar{N}_{Ah} + \frac{\eta_f}{\eta_{Jh}} \bar{N}_{Jh}} \tag{18}$$

Finally, taking log of both sides from Equation 1, and plugging L_{fi} from 17, we get

$$\ln \left(w_{ei}^{*} \right) = \ln \left[\left(1 - \delta_e \right) X_{fi} \right] + \eta_f \ln \left(\alpha_i + \rho \left(N_{Ai} + N_{Ji} \right) \right) \tag{19}$$

which is Equation 4 from the main text.■

The employment equations are obtained straightforwardly from taking the log of equation 13 and plugging L_{fi} from 17.

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