

# The labor market costs of conflict: closures, foreign workers, and Palestinian employment and earnings

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**Abstract** In this paper, we provide a lower bound estimate of the labor market costs of the Israeli–Palestinian conflict. The conflict is quantified by the number of overseas foreign workers in the Israeli labor market and the frequency of temporary closures of the West Bank and Gaza Strip. IV estimates, which exploit a source of exogenous variation in the number of overseas foreign workers, yield significant negative effects of the conflict on Palestinian employment rates in Israel and monthly earnings. Our cost-of-conflict estimates are also relevant for the literature on the economics of immigration.

**Keywords** Conflict · Immigration · Foreign workers · Closures · Employment · Earnings · Instrumental variables

**JEL Classification** J21 · J31 · J40 · J61 · F22 · C23

## 1 Introduction

The economic costs of political conflict have long been a subject of great interest to economists. The large literature in this area offers ample empirical evidence that political instability has important economic consequences. However, most of the leading studies tend to focus on the implications of political instability for macroeconomic variables such as savings, investment and growth [see, e.g., Venieris and Gupta (1986), Barro (1991), Mauro (1995), Alesina and Perotti (1996),

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Abadie and Gardeazabal (2003), and Eckstein and Tsiddon (2004)]. Relatively few papers measure the effects of conflict on individual or household outcomes in particular markets, such as the labor market.<sup>1</sup>

In this paper, we contribute to the literature on the economic costs of political instability by providing a lower bound estimate of the labor market costs of the Israeli–Palestinian conflict.<sup>2</sup> We quantify the conflict by the number of overseas foreign workers in the Israeli labor market and the frequency of closures of the West Bank and Gaza Strip. The presence of overseas foreign workers is directly related to the conflict because their importation was allowed by the Israeli government in order to ease Israeli employers' reliance on Palestinian labor flows that were becoming increasingly unstable. The Israeli government dramatically accelerated its issuance of overseas foreign worker permits starting in the mid 1990s.

The focus is on the implications of the conflict for Palestinian employment rates in Israel and Palestinian monthly earnings. This is accomplished by using unique micro level data from the Palestinian Labor Force Survey (PLFS) of the Palestinian Central Bureau of Statistics (PCBS). Data from the PLFS are combined with quarterly time series data on the number of overseas foreign workers in Israel, and the frequency of temporary closures of the West Bank and Gaza Strip, between the years 1999 and 2004. Because the number of foreign workers in Israel in each quarter is likely to be endogenous, due to nonrandom immigration, we also compile quarterly data on the number of foreign worker permits issued by the Israeli government and use it as an instrument for the number of foreign workers in the Israeli labor market in each quarter [see also Friedberg and Sauer (2003)]. We do not instrument for temporary closures since they are mostly a consequence of surges in the Israeli–Palestinian conflict that have little to do with the unobserved determinants of Palestinian labor demand [see Angrist (1996)].

The results of the study suggest that there are statistically significant negative effects of the conflict on Palestinian employment rates in Israel as well as Palestinian mean monthly earnings. In our preferred specification, the estimates imply that a 10% increase in the supply of foreign workers, or a one standard deviation increase in supply, reduces the employment rate of Palestinians from the West Bank in Israel by 6.8% points. The same increase in the supply of foreign workers reduces the employment rate of Palestinians from Gaza in Israel by 5.0% points. Thus, the overall reduction in the Palestinian employment rate is close to 12% points. The estimates also indicate that an increase of one standard deviation in the supply of foreign workers reduces the mean monthly earnings of Palestinians that reside in the West Bank by 12.2% and reduces the mean monthly earnings of Palestinians that reside in Gaza by 15.8%.

The results also reveal that a one standard deviation increase in the proportion of work days lost during a quarter due to temporary closures of the West Bank and Gaza Strip (roughly a doubling in the mean proportion of work days lost over the

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<sup>1</sup> A notable exception is Angrist and Kugler (2004), who analyze the consequences of a shift in the drug trade (and related violence) on the income of the self-employed and the labor supply of teenage boys in Columbia.

<sup>2</sup> Other economic and political consequences of the Israeli–Palestinian conflict are examined in Berman and Laitin (2005), Berrebi and Klor (2005), and Jaeger and Paserman (2005).

sample period), reduces the employment rate of Palestinians from the West Bank in Israel by 5.2% points. The corresponding estimate for Palestinians from Gaza is 4.1% points. A one standard deviation increase in temporary closures thus reduces the Palestinian employment rate in Israel by 9.3% points. The same increase in the proportion of work days lost due to closures reduces the mean monthly earnings of Palestinians from the West Bank by 5.9%, and the mean monthly earnings of Palestinians from Gaza by 5.3%.

It is interesting to note that our estimates not only provide a lower bound on the labor market costs of a particular political conflict, but can also be put into the more general context of the economic consequences of immigration. In the immigration literature, it is rare that one finds significant negative effects of new immigrants on the employment and earnings outcomes of incumbent workers (see, e.g., Borjas (1987), Card (1990), Altonji and Card (1991), Pischke and Velling (1997), Friedberg (2001) and Card (2001)).<sup>3</sup> The lack of significant effects is usually attributed to problems associated with appropriately defining competing groups of workers, workers responding to immigration by moving their labor and capital to other areas, and new immigrants locating in growing local economies [Borjas (2003)].

In this paper, we can reasonably overcome some of these problems. First, we are examining data that relate to two groups of workers that truly compete in the labor market. In several employment sectors in the Israeli labor market, Palestinian day laborers are the incumbent workers and overseas foreign workers are the new immigrants. Second, the PLFS panel data include information on the employment and earnings of Palestinians that work in the Israeli labor market as well as in the local Palestinian economy, to which they are most likely to move their labor services after displacement by overseas foreign workers. Therefore, our estimates suffer less from sample-selection biases that arise when data on the outcomes of displaced individuals are not available [see Card (2001)]. Lastly, we can partially correct for biases due to nonrandom immigration by using government issued foreign worker entry permits as an instrument for the number of foreign workers in the Israeli labor force.

The rest of this paper is organized as follows. The next section describes the PLFS data and provides a descriptive analysis of the PLFS as well as the data on foreign workers, foreign worker permits and temporary closures. Section 3 outlines the empirical strategy that we employ. Section 4 discusses the estimation results. In Sect. 5, we illustrate the extent of sample selection bias that would have arisen had post-displacement data on Palestinians in the local economies of the West Bank and Gaza Strip not been available. The last section summarizes and concludes.

## 2 Data and descriptive analysis

### 2.1 Palestinians

The PLFS of the West Bank and Gaza Strip is administered by the by the PCBS. The PLFS began in 1995, following the signing of the Oslo Accords and the creation

<sup>3</sup> Borjas (2003) is a notable exception.

of the Palestinian Authority (PA). In the PLFS, the same household is investigated 4 times over 6 quarters. Two investigations are conducted during two consecutive quarters and then after a break of two quarters, there are two more consecutive investigations. Households are subsequently dropped from the sample. Each yearly survey round, after 1998, contains approximately 7,600 households with 22,000 individuals aged 15 years and above residing in the West Bank or Gaza Strip. Nomads and persons living in institutions such as prisons or shelters are not included in the survey.

We restrict the sample from the PLFS to males in the labor force between the ages of 18 and 64, and surveyed during the twenty-four quarters between quarter one of 1999 and quarter four of 2004. Palestinian women are excluded because their labor force participation rates have traditionally been low, especially in the Israeli labor market. Rounds of the survey prior to 1999 are not considered for several reasons. First, the methodology of the sample design was substantially different before 1999. In 1995, the survey was conducted in one quarter only and it was an experimental sample. In 1996, the survey was conducted over three quarters. It wasn't until 1998, after the Palestinian census in 1997, that the survey was conducted in all four quarters of the year. Second, the percentage of individuals that contribute only one quarter of data is 65% between the years 1995 and 1998. This is in contrast to 5.6% during the survey years 1999 to 2004. Third, it is currently not possible to link the records of individuals that overlap the survey years 1998 and 1999.

Table 1 presents descriptive statistics on Palestinian employment and earnings outcomes, separately for residents of the West Bank and residents of the Gaza Strip. Column (1) shows a sharply falling employment rate between 1999 and 2004 among residents of both regions. The employment rate among Palestinians from the West Bank fell by 16% points, from a high of .906 in 1999 to .746 in 2004. Note the steep drop in the employment rate from 2000 to 2001. This is most likely a consequence of the second Palestinian uprising which began in September 2000. The employment rate among Palestinians from the West Bank continued to fall after 2001, to a low of .688 in 2002, but began to recover in 2003. The employment rate among Palestinians from Gaza fell by 20% points over the period with a similarly steep decrease from 2000 to 2001, and a modest recovery in 2003. Note that throughout the period, residents of Gaza have employment rates which are approximately 10% points lower than residents of the West Bank.

Column (2) displays roughly similar employment rate patterns as in Column (1), after further restricting the sample to individuals who report being wage earners (this excludes employers, the self-employed and unpaid family members). Note that there is no clear recovery in the employment rate of wage earners in 2003. Similarly, the employment rate of Palestinian wage earners in Israel<sup>4</sup> [Column (3)] decreases nearly monotonically. Among Palestinians from the West Bank, the employment rates in Israel fell from a high of 28% in 1999 to a low of 10% in 2004. Among Palestinians from Gaza, employment rates in Israel fell from a high of 16% in 1999 to a low of 1% in 2004.

<sup>4</sup> This includes Palestinians who work in Israeli settlements.

**Table 1** Descriptive statistics Palestinian employment and earnings outcomes

Year	Employed (1)	Employed wage earners (2)	Employed wage earners in Israel (3)	Monthly earnings (NIS) (4)	Monthly earnings in Israel (NIS) (5)	Days worked per month in Israel (6)	Sample size (7)
Residents of the West Bank							
1999	.906	.694	.275	1,486 (816)	1,695 (767)	19.8 (5.1)	20,524
2000	.871	.678	.236	1,494 (795)	1,693 (718)	19.4 (4.8)	20,807
2001	.756	.603	.156	1,290 (549)	1,450 (623)	18.7 (6.4)	18,619
2002	.688	.570	.102	1,360 (646)	1,737 (896)	20.2 (6.5)	14,496
2003	.740	.552	.104	1,294 (854)	1,758 (908)	20.1 (6.4)	18,055
2004	.746	.553	.098	1,312 (897)	1,780 (1,236)	20.1 (6.1)	17,656
Residents of the Gaza Strip							
1999	.823	.741	.159	1,299 (845)	1,933 (685)	20.2 (3.3)	10,212
2000	.809	.744	.132	1,261 (809)	1,893 (712)	20.0 (3.6)	9,722
2001	.643	.688	.013	1,130 (473)	805 (482)	16.6 (5.2)	8,896
2002	.598	.644	.017	1,124 (664)	1,427 (902)	18.0 (5.3)	8,752
2003	.702	.632	.026	1,020 (548)	1,484 (771)	17.9 (4.3)	9,562
2004	.628	.675	.009	1,119 (670)	1,627 (871)	17.2 (4.8)	9,303

*Note* Data are drawn from the Palestinian Labor Force Surveys (PLFS) of the Palestinian Central Bureau of Statistics (PCBS). Columns (1) through (6) contain sample proportions and means. Standard deviations for the means are in parentheses. Monthly earnings are in constant 1996 New Israeli Shekels (NIS). In 1996, 1 NIS equals approximately .33 US dollars

Columns (4)–(6) of Table 1 report information on monthly earnings regardless of work location, monthly earnings among Palestinians that work in Israel, and the number of days worked per month in Israel among this latter group. A comparison of Columns (4) and (5) reveals that mean monthly earnings among Palestinians that work in Israel are higher than the mean monthly earnings of Palestinians over all work locations. Thus, there is an Israeli labor market earnings premium for both residents of the West Bank and the Gaza Strip. This premium also increases over the sample period [see Angrist (1992, 1995)].

**Table 2** Descriptive statistics background characteristics

	Residents of the West Bank (1)	Residents of Gaza (2)	Residents of the West Bank working in Israel (3)	Residents of Gaza working in Israel (4)
Married	0.69	0.75	0.70	0.93
Urban	0.38	0.56	0.31	0.60
Refugee camp	0.12	0.32	0.11	0.27
Age	33.7 (11.2)	34.4 (10.9)	31.4 (9.7)	36.5 (8.6)
Years of schooling	9.9 (3.8)	10.4 (3.9)	9.0 (3.0)	8.9 (3.4)
Sample size	110,157	56,447	18,546	3,492

*Note* Data are drawn from the Palestinian Labor Force Surveys (PLFS) of the Palestinian Central Bureau of Statistics (PCBS). Columns (1) through (4) contain sample proportions and means. Standard deviations for the means are in parentheses

In Column (4), it is evident that mean monthly earnings regardless of work location fell between 1999 and 2004 for residents of both the West Bank and the Gaza Strip. Mean earnings are also consistently higher among residents of the West Bank than residents of Gaza throughout the period. In contrast, Column (5) shows that mean monthly earnings of residents of the West Bank who work in Israel slightly increased between 1999 and 2004. However, this was not the case for Palestinians from Gaza working in Israel.<sup>5</sup> Residents of the West Bank who worked in Israel also did not experience a decrease in mean days worked in Israel over the period while residents of Gaza did.

Table 2 presents a comparison of background characteristics of Palestinians by region of residence and work location. Columns (1) and (2) show that residents of Gaza are more likely to live in an urban area and a refugee camp than are residents of the West Bank. In terms of marital status, age and years of schooling, the two groups are quite similar. Columns (3) and (4) illustrate that residents of the West Bank who work in Israel are less likely to live in an urban area, are younger, and less educated compared to the population of West Bank residents. Residents of Gaza that work in Israel are more likely to be married and older but less educated than the population of Gaza residents.

The differences in characteristics in Table 2 between Palestinian workers in Israel and the population as a whole, by region, are broadly reflective of Israel's Palestinian work permit policy and the greater relative ability to enforce that policy in Gaza. Including these background characteristics in the regressions will help capture the influence of Israel's Palestinian work permit policy, since the issuance of work permits to Palestinians is primarily based on these observed characteristics.<sup>6</sup>

<sup>5</sup> The monthly earnings of residents of Gaza that work in Israel were higher than the monthly earnings of residents of the West Bank before September 2000. This could be due to the relatively larger proportion of Gaza residents working in construction as opposed to agriculture prior to 2001 (see Table 3 below).

<sup>6</sup> Israel began issuing work permits allowing Palestinians to work in Israel in the early 1970s.

**Table 3** Palestinian and foreign worker employment in Israel by sector

Year	Agriculture (1)	Construction (2)	Manufacturing (3)	Commerce hotels (4)	Transport storage (5)	Services (6)
<b>Residents of the West Bank</b>						
1999	.073	.552	.131	.144	.018	.082
2000	.075	.551	.123	.159	.018	.074
2001	.066	.506	.146	.179	.018	.085
2002	.075	.409	.173	.208	.025	.111
2003	.066	.466	.154	.196	.021	.098
2004	.075	.410	.167	.209	.029	.111
<b>Residents of the Gaza Strip</b>						
1999	.140	.603	.148	.076	.011	.024
2000	.179	.520	.172	.090	.020	.019
2001	.239	.058	.566	.106	.000	.032
2002	.264	.391	.302	.030	.014	.000
2003	.190	.452	.302	.049	.006	.000
2004	.138	.495	.270	.097	.000	.000
<b>Foreign workers</b>						
1999	.115	.332	.012	.040	.000	.502
2000	.105	.309	.011	.056	.000	.519
2001	.099	.336	.010	.063	.000	.492
2002	.097	.318	.011	.060	.000	.514
2003	.113	.268	.088	.062	.000	.549
2004	.135	.267	.078	.060	.000	.530

*Note* Data on Palestinians are drawn from the Palestinian Labor Force Surveys (PLFS) of the Palestinian Central Bureau of Statistics (PCBS). Data on foreign workers are from the Israel Central Bureau of Statistics (ICBS). Columns (1) through (6) contain row percentages that sum to one

A defining aspect of Palestinian employment in Israel is its concentration in a small number of employment sectors, and in low skill occupations, as is generally characteristic of migrant labor in relatively advanced economies. The two top panels of Table 3 report Palestinian employment rates over six Israeli employment sectors between 1999 and 2004. Palestinians from the West Bank are concentrated in the construction, manufacturing and hotel sectors in Israel, with the bulk of employment being in construction. Palestinians from Gaza are highly concentrated in construction, manufacturing and agriculture, also with the bulk of employment in construction.<sup>7</sup>

<sup>7</sup> Note that residents of Gaza shifted more sharply out of construction and into agriculture and manufacturing than residents of the West Bank starting in 2001. This could partially explain why residents of Gaza experienced a decrease in mean monthly earnings in Israel as opposed to residents of the West Bank (see Table 1).

## 2.2 Foreign workers

The quarterly time series data on the total number of overseas foreign workers in Israel that we use were collected by the Israel Central Bureau of Statistics (ICBS). In constructing the total number of foreign workers (legal and illegal), the ICBS takes into account the date of entry into Israel, the date of exit, and the country of origin of individuals that received work permits or tourist visas. The ICBS measure of the total number of foreign workers thus includes both legal permit holders and illegal immigrants.

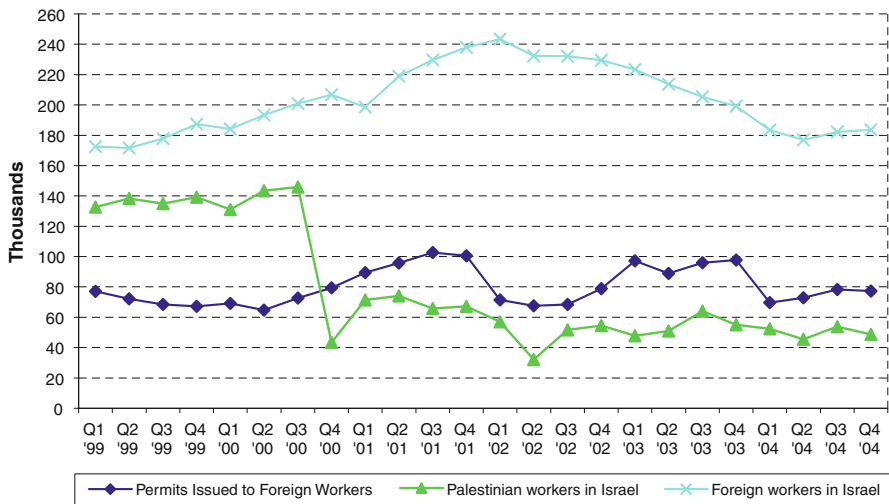
The bottom panel of Table 3 shows the distribution of foreign worker employment in Israel. Note that foreign workers are concentrated in construction, agriculture and services (household services). Thus, there is a substantial overlap in sector of employment in Israel between Palestinians and overseas foreign workers. The overwhelming majority of foreign workers are also employed in low skill occupations. The main mismatch in the employment distribution between Palestinians and foreign workers is in the manufacturing and household services sectors. Nonetheless, Table 3 clearly indicates a substantial amount of competition between the two types of labor input.

It should be noted that in the empirical work that follows, we do not control for sector of employment in Israel because we do not have information on foreign worker permits by employment sector (the instrument), only aggregate numbers of permits in each quarter. As a result, we may be slightly overstating the extent of competition between the two groups due to lack of more detailed data on foreign worker permits. The implication is that our estimated effects of foreign workers on Palestinian employment outcomes are likely to be somewhat conservative, or biased towards zero.

Regarding the total number of foreign workers in Israel, ICBS estimates indicate a relatively small number prior to 1994. In 1991, there were only 8,000 overseas foreign workers in the country. In 1994, the number grew to 65,000 and by the end of 1995, there were about 120,000. Figure 1 shows that there were approximately 180,000 foreign workers in Israel in the first quarter of 1999. The number grew to a peak of 240,000 in the first quarter of 2002 and subsequently fell to around 180,000 once again in 2004. The mean number of foreign workers over the sample period is 203,500 (with a standard deviation of 22,750).

Interestingly, the mean of 203,500 total foreign workers in Israel over the sample period can be decomposed into 131,500 illegal foreign workers and only 72,000 legal foreign workers (permit holders). According to data supplied to us by the Israel Ministry of Labor and Social Affairs, the mean number of permits issued over the sample period is 80,140 (with a standard deviation of 12,370), which exceeds the mean number of legal foreign workers. The relatively high proportion of illegal foreign workers in the Israeli labor market is generally thought to be a consequence of the wage premium that illegal foreign workers can capture in the informal market and the relatively low risk of deportation. Permit holders become illegal foreign workers when their permits are not renewed after expiration (permit length is usually 2 years) and they do not leave the country. They also become illegal when





**Fig. 1** Foreign workers, foreign worker permits, and Palestinian laborers in Israel *Note* Data are drawn from the PLFS, the ICBS and the Israeli Ministry of Labor

they accept employment with an employer other than the employer to whom the work permit was originally issued.<sup>8</sup>

It is important to note that the allocation of foreign worker permits by the Israel Ministry of Labor and Social Affairs to Israeli employer associations is periodically reviewed by the Israel State Comptroller’s Office. In establishing the number of permits as a potential source of exogenous variation, we rely on these State Comptroller reports. The reports regularly point to hundreds of deficiencies in the foreign worker permit allocation process.

For example, Israeli employers often file more employment requests than the market requires leading to delays in issuance that can last many months. There is also a lack of computerization and coordination between different authorities within the Ministry. These problems have led to work permits being issued for already finished construction projects, for projects that are not allowed to begin because of lack of proper building permits, and for planned harvests that are based on unverified reports by farmers.

In Fig. 1, we present graphical evidence on the relevance of the instrument. Figure 1 suggests a strong correlation between the number of permits issued each quarter and the total number of foreign workers. It is also clear that there is a sharp increase in the number of foreign worker permits issued, as well as total number of foreign workers in the Israeli labor market, following the beginning of the second Palestinian uprising in the fourth quarter of 2000. Note the large drop in the number

<sup>8</sup> In 2002, in the agricultural sector, most legal foreign workers are from Thailand. In the construction sector, most legal foreign workers are from Romania, the former USSR, China, Turkey, Bulgaria and Thailand. Illegal foreign workers tend to originate from Romania, Philippines, India, Sri Lanka, Burma, Bulgaria, Hungary, Poland, the former USSR, South America, Africa, Jordan, China, Turkey and Thailand (see [www.kavlaoved.org.il/workers/data\\_en.asp](http://www.kavlaoved.org.il/workers/data_en.asp)). Unfortunately, these data are not comprehensive enough to be fruitfully included in estimation.

of Palestinians working in Israel (adjusted by PLFS sampling weights) in the fourth quarter of 2000, which fails to recover to pre-2000 levels.<sup>9</sup>

### 2.3 Temporary closures of the West Bank and Gaza Strip

In December 1987, when the first Palestinian uprising began, Israel's security concerns led to occasional closures of the West Bank and Gaza Strip. In 1991, with the start of the first Gulf War, Israel closed off the West Bank more consistently and for relatively longer periods of time. Israel continued to impose temporary closures on the West Bank and Gaza Strip subsequent to the first Gulf War, concomitant with surges, or expected surges, in the Israeli–Palestinian conflict.

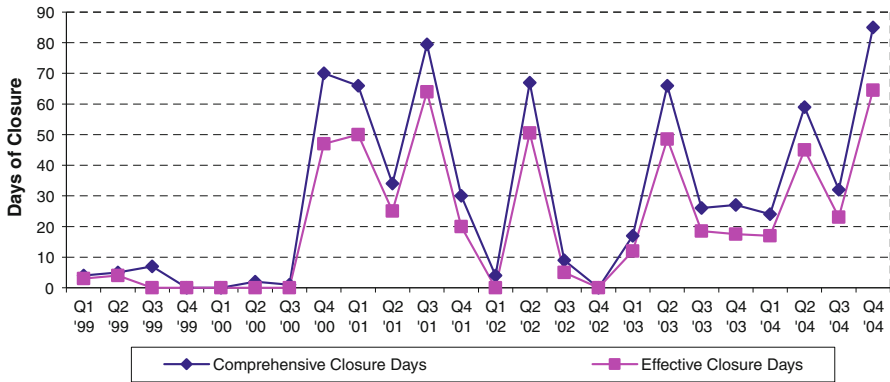
Our data on temporary closures of the West Bank and Gaza strip were supplied by the Office of the United Nations Special Coordinator (UNSCO) in Ramallah. UNSCO was established in June 1994 following the signing of the Oslo Accords. The mission of UNSCO is to aid in the transition process and strengthen UN inter-agency cooperation to meet the financial, technical, economic and other needs of Palestinians.

UNSCO provided us with data on the number of days of external closures imposed by Israel on the West Bank and Gaza Strip in each quarter between 1999 and 2004. External closures lead to limited movement of people and goods between the West Bank, Gaza, and Israel (as well as third countries). UNSCO does not provide data on the number of days of internal closures. Internal closures restrict movement within the West Bank and Gaza Strip.

Figure 2 plots the UNSCO data on the number of days of comprehensive closures and the number of days of effective closures in each quarter between 1999 and 2004. UNSCO calculates the number of days of effective closures by netting out of comprehensive closures Saturdays, half the number of Fridays (labor and commercial flows are at about half their normal workday level on Fridays) and universally-celebrated Jewish and Muslim holidays. Figure 2 shows that closures were relatively infrequent between 1999 and the start of the second Palestinian uprising. In the fourth quarter of 2000, there is a dramatic increase in the number of days of closure, which fluctuates with a rather high variance throughout the rest of the sample period. The strong economic growth in the region and the low level and relative constancy of closures before the second Palestinian uprising, strongly suggests that closures can be considered exogenous to the unobserved determinants of Palestinian labor demand in Israel.

In the estimations that follow, we measure the frequency of closures each quarter by the “proportion of potential work days lost”. That is, we divide the number of days of effective closures by the number of potential work days in the quarter. Over the sample period, the mean number of days of effective closures is 21.44. The mean number of potential work days (which also excludes Saturdays, half the

<sup>9</sup> The number of Palestinian laborers in Israel falls from a high of 140,000, just prior to the fourth quarter of 2000, to around 50,000 in the fourth quarter of 2004. The mean number of Palestinians in the Israeli labor market over the period is 79,200 with a standard deviation of 39,600.



**Fig. 2** Days of closure of the West Bank and Gaza Strip *Note* Data come from the United Nations Special Coordinator Office (UNSCO). Effective closure days are comprehensive external closure days after subtracting Saturdays, half the number of Fridays in the quarter and universally-celebrated Jewish and Muslim holidays

number of Fridays and Jewish and Muslim holidays) is 69.21. The resulting mean proportion of potential work days lost is .31 (with a standard deviation of .32.)

### 3 Estimation strategy

The empirical model we use to measure the effect of overseas foreign workers and temporary closures on Palestinian employment and earnings is

$$Y_{it} = \alpha_0 + \alpha_1 F_t + \alpha_2 C_t + \beta X_{it} + \varepsilon_{it}, \tag{1}$$

where  $Y_{it}$  is either a dummy indicating employment in Israel or the natural logarithm of monthly earnings (in Israel or the local Palestinian economy).  $F_t$  is the total number of overseas foreign workers in Israel in quarter  $t$ , and  $C_t$  is the proportion of work days lost in quarter  $t$  due to closures. The vector  $X_{it}$  includes years of schooling, age and age squared, as well as dummies indicating marital status, residence in an urban area, and residence in a refugee camp. Also included in  $X_{it}$  are quarterly and year effects.  $\varepsilon_{it}$  is the error term. Estimation of Eq. (1) is performed separately for residents of the West Bank and residents of the Gaza Strip.

A structural interpretation can be given to Eq. (1) under several assumptions. Suppose the supply of Palestinian labor to Israel is approximately infinitely elastic at the reservation wage to work in Israel. This is plausible given the large wage premium Palestinians earn when employed in Israel vis-à-vis the local Palestinian economy [see Angrist (1995, 1996)]. The wage premium can be partially accounted for by the substantial commuting costs that Palestinian day laborers incur. Under these assumptions, Eq. (1) can be considered a demand curve for Palestinian labor in Israel, where  $F_t$  is related to the price of substitute (overseas foreign) labor, and the own-price of Palestinian labor varies with  $C_t$ .

Note that as  $F_t$  increases, the price of overseas foreign workers decreases, and the demand for Palestinian labor should decrease. This produces a negative  $\alpha_1$ . If increases in  $C_t$  translate into higher Palestinian reservation wages due to higher commuting costs, then the demand for Palestinian labor should decrease [Angrist (1996)]. This leads to a negative  $\alpha_2$ . Our instrument for  $F_t$  (government issued foreign worker permits) addresses the endogeneity of the price of substitute labor, and we assume exogenous own price variation via changes in  $C_t$ . The background characteristics in  $X_{it}$ , which help control for Palestinian work permit policy, are to varying degrees endogenous regressors over the long run. We do not have additional valid instruments that could be used to assess the importance of this latter endogeneity problem.

In addition to OLS estimates of Eq. (1), IV estimates are obtained. The first stage in two-stage least squares estimation of Eq. (1) is,

$$F_t = \pi_0 + \pi_1 P_t + \pi_2 C_t + \pi_3 X_{it} + \zeta_{it}, \quad (2)$$

where  $P_t$  is the cumulative number of foreign worker permits issued through quarter  $t$  since 1991. We use the number of permits issued in 1991 as an initial condition because it is the first year of data on permits at our disposal.<sup>10</sup>

The error term in Eq. (2),  $\zeta_{it}$ , is likely to be correlated with  $\varepsilon_{it}$  in Eq. (1) because both error terms contain factors related to labor demand in Israel and the surrounding region. For example, growth in the region as a whole could lead to voluntary movement of Palestinian day laborers back into the local economies of the West Bank and Gaza Strip, and simultaneous increased entry of illegal foreign workers into the Israeli labor market.<sup>11</sup> As argued earlier, the potential exogeneity of  $P_t$  arises due to administrative lags and inefficiencies in the issuance of foreign worker permits, leading to “random” permit issuances.  $P_t$  will also not be perfectly correlated with  $F_t$  because of the availability of illegal foreign labor.<sup>12</sup>

<sup>10</sup> Using ICBS data in the first half of the 1990s Friedberg and Sauer (2003), introduced foreign worker permits as an instrument for overseas foreign workers in studying the effect of foreign workers in Israel on Palestinian labor market outcomes. There are several advantages of our estimates over theirs. First, there were only a negligible number of overseas foreign workers in the early 1990s. Second, PCBS data on the Palestinian economy are widely believed to be much more reliable than ICBS data. The ICBS ceased collecting data on Palestinians in the West Bank and Gaza Strip in 1995.

<sup>11</sup> Observed proxies for the total demand for foreign workers and Palestinians (such as aggregate Israeli wages or GDP per capita) are not directly included in estimation because they could lead to potentially severe proxy variable biases.

<sup>12</sup> Individual fixed effects are not included in Eq. (1) because they are not plausibly correlated with foreign worker supply or closures, which vary at the quarterly level. In addition, estimating with random effects considerably reduces standard errors. Thus, to be conservative, we do not report them (see Miaari and Sauer (2006) for results with individual effects). Other sources of persistence, such as lagged employment status, are not included because of a potentially severe missing data problem—the PLFS sampling frame skips two quarters. Thus, the data limit our ability to examine issues of state-dependence versus unobserved heterogeneity and its effect on the coefficients of interest.

## 4 Estimation results

### 4.1 Palestinian employment in Israel

Table 4 presents estimates from a linear probability model for working in Israel using the first PLFS household interview only. OLS estimates of the coefficient on foreign workers in Column (1) indicate weak but statistically significant effects on Palestinians from both the West Bank and Gaza Strip. The statistical significance is slightly reduced when standard errors are clustered at the quarterly level rather than at the individual level.

The coefficient of  $-0.0019$  in the top panel implies that an increase of 20,000 foreign workers, which is equivalent to a 10% increase in supply (or a one standard deviation increase in the mean number of foreign workers over the sample period), reduces the employment rate of Palestinians from the West Bank in Israel by 3.8% points. For Palestinians from Gaza, the employment rate in Israel is reduced by 2.4% points.

IV estimates of the effect of foreign workers in Column (3) are much stronger than OLS estimates and remain statistically significant. Note that the first stage estimates in Column (2) indicate that the permit instrument is highly relevant in both sub-samples, regardless of the level of clustering.

The IV coefficient of  $-0.0034$  in Column (3) in the top panel implies that an increase of 10% in the supply of foreign workers reduces the employment rate of Palestinians from the West Bank in Israel by 6.8% points. Since the size of the wage earner labor force in the West Bank in 1999 is 370,319, a reduction of 6.8% points in the employment rate translates into 25,182 less Palestinians from the West Bank working in Israel for every 20,000 additional foreign workers. This corresponds to a substitution rate of 1.26 fewer West Bank day laborers for each additional foreign worker.

The estimated substitution rate of one and a quarter to one could be due to the following reasons. First, Palestinians day laborers may have a substantially decreased incentive to actively search for employment in Israel as foreign workers enter in large numbers and depress wage offers below the reservation wage, or cause a change in job tasks and working conditions. Second, it is commonly believed that foreign workers work much longer days than Palestinians. This is because Palestinians commute to their jobs in Israel in the morning and return to the West Bank (or Gaza) by late afternoon. In contrast, legal foreign workers are permitted to reside in Israel, and many foreign workers in construction and agriculture actually live on the work site.

The IV estimate in Column (3) in the bottom is also precisely estimated and implies that an increase of 10% in the supply of foreign workers reduces the employment rate of Palestinians from the Gaza Strip by 5.0% points. This corresponds to 8,636 fewer Palestinians from Gaza working in Israel (the size of the wage earner labor force in Gaza in 1999 is 172,715), or a substitution rate of substantially less than one-to-one (.43). The smaller effect of foreign workers on residents of Gaza could be due to lower starting reservation wages among Gaza residents. Lower reservation wages, compared to Palestinians from the West Bank,

**Table 4** Estimation results Palestinian employment in Israel

	First interview sample			Multiple interview sample		
	OLS (1)	First stage (2)	IV (3)	OLS (4)	First stage (5)	IV (6)
Residents of the West Bank						
Foreign workers	-.0019 (.0001)	-	-.0034 (.0002)	-.0015 (.0001)	-	-.0036 (.0002)
Closures	-.1809 (.0064)	-1.1483 (.1883)	-1.1707 (.0065)	-1.822 (.0041)	-3.5114 (.0851)	-1.1733 (.0043)
Foreign worker permits	-	1.0086 (.0074)	-	-	.9926 (.0038)	-
		(.2994)			(.2636)	
$R^2$	.065	.766	-	.061	.767	-
$N$	39,122	39,122	39,122	110,157	110,157	110,157
Implied rate of substitution	.70	-	1.26	.56	-	1.33
Residents of the Gaza Strip						
Foreign workers	-.0012 (.0001)	-	-.0025 (.0002)	-.0011 (.0001)	-	-.0029 (.0001)
Closures	-1.316 (.0050)	-1.7416 (.2625)	-1.241 (.0053)	-1.447 (.0040)	-3.6372 (.1183)	-1.1367 (.0042)
	(.0278)	(.75164)	(.0318)	(.0272)	(.74149)	(.0299)

**Table 4** continued

	First interview sample			Multiple interview sample		
	OLS (1)	First stage (2)	IV (3)	OLS (4)	First stage (5)	IV (6)
Foreign worker permits	–	1.0061 (.0104)	–	–	.9902 (.0051)	–
$R^2$	.081	.790 (.2941)	–	.079	.785 (.2543)	–
$N$	20,025	20,025	20,025	56,447	56,447	56,447
Implied rate of substitution	.22	–	.43	.19	–	.50

*Note* Estimates are from linear probability models of working in Israel. Sample includes men aged 18–64. Standard errors (in parentheses) are clustered at the individual (first set) and quarterly (second set) levels. All regressions include years of schooling, age, age-squared, marital status, urban area residence, refugee camp residence, unrestricted quarter effects and year effects for the recession years of 2001 and 2002. The implied rate of substitution is the number of Palestinians displaced by one foreign worker

could arise as alternative employment opportunities in Gaza are considerably more limited.

Columns (4)–(6) report estimates using multiple interviews from each household instead of only the first interview. The instrument remains relevant and the IV estimates in Column (6) are slightly larger than the IV estimates in Column (4). The estimated rate of substitution increases from 1.26 to 1.33 for residents of the West Bank, and from .43 to .50 for residents of Gaza.

Table 4 also reports the effect of temporary closures on the employment rates of Palestinians. The point estimate in Column (6) in the top panel is  $-.1733$  and is statistically significant, regardless of the level of clustering. The estimate implies that a one standard deviation increase (or doubling) of the frequency of closures, from roughly one-third of potential work days lost to two-thirds of potential work days lost in a quarter, decreases the employment rate of Palestinians from the West Bank in Israel by 5.2% points. The corresponding estimate in the bottom panel implies that a one standard deviation in the frequency of closures reduces the employment rate of Palestinians from Gaza in Israel by 4.1% points.

#### 4.2 Palestinian monthly earnings

Table 5 presents estimates of the effects of foreign workers and closures when the dependent variable in Eq. (1) is the natural log of Palestinian monthly earnings. In both the first interview and multiple interview samples, the IV estimates are negative and precisely estimated, regardless of level of clustering. IV estimates are also much more strongly negative than OLS estimates. The first stage estimates are the same as in Table 4.

The IV point estimate of  $-0.0061$  in Column (6) in the top panel implies that a 10% increase in the supply of foreign workers (a one standard deviation increase) reduces the mean monthly earnings of Palestinians from the West Bank by 12.2%. The corresponding estimate for Palestinians from Gaza is  $-.0079$ , or a reduction in mean monthly earnings of 15.8%. The larger impact of foreign workers on the mean monthly earnings of Palestinians from Gaza is consistent with the weaker impact of foreign workers on this latter group's employment rate in Israel. That is, relatively worse employment opportunities in the local economy of the Gaza Strip generate lower reservation wages for working in Israel and larger earnings losses due to displacement from the Israeli labor market.

The IV point estimate of  $-.1979$  in Column (6) in the top panel implies that a doubling of the frequency of closures (a one standard deviation increase) reduces the mean monthly earnings of Palestinians from the West Bank by 5.9%. The corresponding estimate of  $-.1765$  for Palestinians from Gaza yields a reduction in mean monthly earnings of 5.3%. Both of these coefficients are precisely estimated regardless of the level of clustering.

#### 4.3 Additional results

Several additional estimation results, not reported for sake of brevity, are worthy of mention. Among Palestinians from the West Bank, IV estimates of the linear



**Table 5** Estimation results Palestinian monthly earnings employed in Israeli and/or Palestinian economy

	First interview sample		Multiple interview sample	
	OLS (1)	IV (2)	OLS (3)	IV (4)
<b>Residents of the West Bank</b>				
Foreign workers	-.0020 (.0004) (.0012)	-.0072 (.0007) (.0021)	-.0013 (.0002) (.0012)	-.0061 (.0004) (.0016)
Closures	-.2182 (.0169) (.0580)	-.1795 (.0177) (.0856)	-.2216 (.0095) (.0518)	-.1979 (.0096) (.0725)
$R^2$	.115	-	.104	-
$N$	17,210	17,210	49,470	49,470
<b>Residents of the Gaza Strip</b>				
Foreign workers	-.0037 (.0004) (.0007)	-.0079 (.0008) (.0029)	-.0033 (.0002) (.0006)	-.0079 (.0007) (.0027)
Closures	-.1712 (.0199) (.0468)	-.1365 (.0205) (.0698)	-.2034 (.0116) (.0453)	-.1765 (.0116) (.0684)
$R^2$	.288	-	.264	-
$N$	20,025	20,025	56,447	56,447

*Note* The dependent variable is the log of monthly labor market earnings in Israel and/or the local Palestinian economy (West Bank and Gaza Strip). Sample includes men aged 18–64. Standard errors (in parentheses) are clustered at the individual (first set) and quarterly (second set) levels. The first stage estimates are the same as in Table 4. All regressions include years of schooling, age, age-squared, marital status, urban area residence, refugee camp residence, unrestricted quarter effects and year effects for the recession years of 2001 and 2002

probability model indicate that all background characteristics, except residing in an urban area (which has a positive effect), are not significantly different from zero. All quarter and year effects in this model are highly significant. In the log-linear model of monthly earnings for Palestinians residing in the West Bank, IV estimates yield significant schooling, age, quarter and year effects. However, an extra year of schooling increases mean monthly earnings by only a small amount.

In the linear probability model for Palestinians from Gaza, IV estimates yield significant marital status, age, quarter and year effects. Older and married Palestinians from Gaza are more likely to be employed in Israel, reflecting Israel's Palestinian work permit policy and tighter border controls in Gaza. In the log-linear model of monthly earnings, IV estimates yield significant schooling, age, marital status, quarter and year effects. The estimated return to schooling is much higher than for Palestinians from the West Bank, as is the marriage premium, and the concavity of the age-earnings profile. These additional results are consistent with earlier findings on the impact of background characteristics on Palestinian employment in Israel and Palestinian earnings using ICBS data on Palestinians

[see Angrist (1992, 1995, 1996, 1998), Friedberg and Sauer (2003) and Yashiv (2004)].<sup>13</sup>

We also ran additional regressions in which we aggregated up to the quarterly level. This was accomplished by first estimating employment and earnings regressions with individual level characteristics only. The predicted values of the dependent variable were aggregated up to the quarterly level. The aggregated quarterly predictions were then regressed on the quarterly data on overseas foreign workers and temporary closures [see Donald and Lang (2007) for a discussion of similar strategies]. OLS and IV versions of these aggregate regressions did not yield precise estimates of the effects of foreign workers and closures.

## 5 The importance of post-displacement earnings information

In most studies of immigration, information on the earnings of individuals after displacement by immigrants is not available. In this section, we simulate this common situation by restricting the sample to only Palestinians who work in Israel in all periods. That is, individuals who work in Israel in one period, report earnings, and subsequently work in the local Palestinian economy and report earnings there as well, are excluded from the sample. This produces a selected sample and allows an assessment of the contribution of our post-displacement earnings data (as is used in Table 5). This strategy allows us to quantify the extent of sample selection bias that would have arisen had the PCBS data set not been so rich. We perform this exercise only for Palestinians from the West Bank since the resulting sample size for Palestinians from Gaza is small.<sup>14</sup>

The OLS and IV estimates in Table 6 show weak and statistically insignificant effects of foreign workers on the earnings of Palestinians employed in Israel in all periods. This is in sharp contrast to the much stronger and precisely estimated effect reported in Column (4) of Table 5. Thus, sample selection substantially biases upward the effect of new immigrants on incumbent workers in this context, and substantially biases downward the labor market costs of the conflict. The same is true for the effect of temporary closures.

## 6 Conclusion

In this paper, we contribute to the literature on the economic costs of political instability by providing a lower bound estimate of the labor market costs of the Israeli–Palestinian conflict. We focus on the implications of the conflict for Palestinian employment rates in Israel and Palestinian monthly earnings. The conflict is quantified by the number of overseas foreign workers in the Israeli labor

<sup>13</sup> Additional specifications show that there are no important nonlinearities in the effect of foreign workers and closures and very few significant interaction terms with background characteristics.

<sup>14</sup> As an indication of the sample size problem for Gaza, see Table 1, which shows that less than 3% of Palestinians are employed in Israel in each year after 2001.

**Table 6** Estimation results Palestinian monthly earnings employed in Israeli economy all periods residents of the West Bank

	Multiple interview sample	
	OLS (1)	IV (2)
Foreign workers	.0004 (.0004) (.0005)	-.0009 (.0008) (.0011)
Closures	-.0336 (.0193) (.0317)	-.0353 (.0193) (.0324)
$R^2$	.093	-
$N$	15,316	15,316

*Note* The dependent variable is the log of monthly labor market earnings for residents of the West Bank that are employed in Israel all periods. Standard errors (in parentheses) are clustered at the individual (first set) and quarterly (second set) levels. The first stage estimates are the same as in Table 4. All regressions include years of schooling, age, age-squared, marital status, urban area residence, refugee camp residence, unrestricted quarter effects and year effects for the recession years of 2001 and 2002

market and the frequency of temporary closures of the West Bank and Gaza Strip. Data on Palestinian employment and earnings outcomes are taken from the PLFS of the PCBS. We combine the PLFS data with quarterly time series data on the number of foreign workers in Israel, the number of foreign worker permits issued to Israeli employers, and the frequency of temporary closures of the West Bank and Gaza Strip, between the years 1999 and 2004.

IV estimates that exploit the number of foreign worker permits issued each quarter by the Israeli government as an instrument for the number of overseas foreign workers in the Israeli labor market, yield large and statistically significant effects of the conflict on Palestinian employment rates in Israel and mean monthly earnings.

Our study also contributes to the immigration literature. We are able to overcome many of the problems associated with not being able to find significant negative effects of new immigrants on incumbent workers. Identification of the effect of new immigrants in this case rests on the fact that overseas foreign workers and Palestinian day laborers truly compete in several employment sectors in the Israeli labor market. In addition, the PLFS panel data include information on the employment and earnings of Palestinians in the local economies of the West Bank and Gaza Strip after displacement by foreign workers in Israel, and we have a potentially credible source of exogenous variation in foreign workers to help correct for biases due to non-random immigration.

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