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The labor market impact of mobility restrictions: Evidence from the West Bank[*]

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Using data on Israeli closures inside the West Bank, we provide novel evidence on the labor market effects of conflict-induced restrictions to mobility. To identify the effects we exploit the fact that the placement of physical barriers by Israel was exogenous to local labor market conditions. These barriers to mobility have a significant negative effect on employment, wages and days worked in the West Bank while they have a positive impact on the number of hours per working day. These effects are driven mainly by checkpoints and only a tiny portion of the effects is due to direct restrictions on workers' mobility. Despite being an under-estimation of the actual effects, the costs of the barriers are substantial: in 2007 they amounted to 6% of GDP. Most of these costs are due to lower wages, suggesting that the labor markets have adjusted to the restrictions more through prices than quantities.

***JEL classification codes*:** J21, J40, J61
***Keywords*:** Conflict, Palestine, Israel, mobility, closures, labor market

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1. Introduction

The efficient mobility of goods and labor is one of the most important features of any functioning economy. Higher transport costs lower real incomes by reducing the extent to which gains from trade can materialise. Donaldson (2010) estimates that increased railroad access raised real income by 16 percent in the average Indian district at the beginning of last century. The cost and time of commuting to work can also affect both labor market participation as well as wages (Gibbons and Machin, 2006). Therefore it is not surprising that both national governments and international organisations spend a large share of resources on transport infrastructure projects.[4]

This paper provides novel evidence on the labor market effects of a draconian system of mobility restrictions: the system of checkpoints, roadblocks and other barriers installed by Israel inside the occupied Palestinian territory (oPt) of the West Bank. Such a system is part of the broader 'closure' regime which was initially put in place by Israel after the first Palestinian uprising in 1987 ('first Intifada') as a security measure to control the movement of goods and persons across the borders and within the oPt. Eventually the system was dramatically expanded during the Palestinian uprising known as the 'second Intifada' in the first half of 2000s to become one of the most pervasive systems of restrictions to mobility imposed in modern conflicts.

Our analysis relies on a number of unique features, which ensure a relatively clean identification of the effects of restrictions on the labor market. First, check-points and other barriers to mobility inside the West Bank have been varying in number and location throughout the years; second, as we argue below, their placement has been related to Israeli security concerns and thus has been largely exogenous to local economic conditions, and labor market conditions in particular. The inclusion of a measure of conflict intensity as a control in the analysis further strengthens the case for the exogeneity of the barriers' effects. Third, systematic labor market data has been consistently collected throughout the last decade of the conflict in the West Bank (and Gaza).[5] In addition, yearly data on the location of the physical barriers to movement within the West Bank throughout the 2000s have been collected by the Applied

[4] For example 20 percent of the World Bank's lending in 2007 was directed to such projects (World Bank, 2008).
[5] The Palestinian Bureau of Statistics started to collect the data immediately after its foundation at the end of 1995.

Research Institute of Jerusalem (ARIJ) and the UN Office for the Coordination of Humanitarian Affairs (OCHA).

We take advantage of these features to causally identify the *marginal* effect of the barriers' placement on employment, wages and labor supply of the Palestinians in the West Bank over the 2000-2009 period. In order to do so we compute a yearly index of barriers' closeness to the individual worker using a refined spatial unit of analysis and examine its impact on labor market outcomes at the same spatial level. The results suggest a significant negative effect of the barriers on the probability to be employed as well as on hourly wages. These effects are almost entirely accounted for by one major type of barriers, i.e. check-points, while the other barriers have a much less significant impact. In particular placing one check-point one minute away from a locality reduces its residents' probability of being employed by 0.5 percentage points and their hourly wage by 5.2%. The check-points have also an impact on the quantity of labor supplied by Palestinian workers, decreasing the number of days worked in a month while increasing the number of hours per working day.

These estimates should be interpreted only as the *marginal* (rather than the *total*) effects of the closures on the labor market, i.e. the difference in labor market outcomes between localities according to their distance to the closures. As the restrictions to mobility affect the entire West Bank economy (e.g. IMF, 2010, World Bank, 2007b and 2010, UNCTAD, 2011), it is not possible to obtain a counterfactual of localities actually unaffected by the closures, which would be necessary to compute the *total* effects of closures. This problem is typical of studies estimating conflicts' economic impact within countries, where even the residents of more peaceful regions are usually also adversely affected by conflict's disruptions (Blattman and Miguel, 2010). In this sense the *marginal* effect we compute is necessarily an under-estimation of the *total* effect of the closures. In addition, our estimates do not take into account other dynamic labor market effects of the barriers, such as those on the ability to accumulate human capital.[6] Similarly internal closures are likely to raise the costs of attending schools for students. Such effects are likely to play out in the medium run and therefore are not captured by our analysis.

[6] Di Maio and Nandi (2013) provide evidence that external closures increase child labor and reduce school attendance in the West Bank.

The analysis also tries to distinguish between the two main channels through which the restrictions can arguably affect the labor market outcomes. The first concerns the role of the barriers in restricting the movement of labor mainly (but not only) within the West Bank. This restriction directly affects the ability of the workforce to supply labor. The second channel is more indirect and operates through the negative effect of the barriers on the economic activity via raising the cost of moving goods and labor. These higher costs should eventually reduce the demand for labor. We can only test explicitly for the first channel and find that this explains only a tiny part of the labor market effects of the checkpoints.

The paper adds to the broader literature on the effects of conflict within countries using micro data. This evidence is still mainly confined to studying the effects of conflict on health and education outcomes (e.g. Bundervoet et al., 2009, Shemyakina, 2011, Verwimp and Van Bavel, 2011). A more limited number of studies focus specifically on the economic impact of conflict, which is a topic more directly related to our study. Abadie and Gardeazabal (2003) provide indirect evidence of the effects of the civil war on economic growth in the Basque region. Miguel and Roland (2011) provide evidence of the economic convergence of Vietnamese regions more affected by the war vis-à-vis the other regions. Closer to the methodology of our study, the recent work of Ksoll et al. (2010) find that the recent ethnic violence in Kenya caused a drop in revenues of flower exporting firms by 38%, which was mainly due to the restrictions imposed on the workers' mobility. Blattman and Annan (2010) and Rodriguez and Sanchez (2012) are among the few studies looking also at the labor market implications of civil conflict, albeit only for children. The former study finds that child soldiers are less likely to be engaged in skilled work, and earn lower wages as adults. The latter shows the negative impact of exposure to armed conflict across Colombian provinces on labor decisions of children. Our study complements this literature by looking at the effects on the overall labor market of an arguably more exogenous conflict-induced shock than violence. In addition it makes an effort to try to unpack the specific channels through which such shock affects the labor market.

The paper also contributes to the specific literature on the Israeli-Palestinian conflict. The most relevant part of this literature for our purposes is the one focusing on the economic effects of the conflict for the Palestinians. As the largest Palestinian export has historically been labor – mainly to Israel – a lot of attention has been devoted in particular to the implications of Israeli

border closure between the oPt and Israel for the Palestinian labor market.[7] By making it more difficult for the Palestinians to reach the Israeli labor market, Israeli closures lower the demand for Palestinian workers in Israel; at the same time, they increase the supply of workers in the Palestinian labor market. That is an important issue given the dependence of the West Bank's and Gaza's labor markets on Israel especially before the outbreak of the second Intifada.

Miaari and Sauer (2011) find that the tight border closure policy enacted by Israel at the beginning of the last decade negatively affected Palestinian employment in Israel, which was mainly replaced by a surge in the inflow of foreign workers.[8] They show that a 10% increase in foreign workers in Israel reduces employment rates for Palestinians from the West Bank by 6.8%, while doubling the number of closure days reduces it by 5.2%. That is consistent with the theoretical model by Rupper Bulmer (2003), which predicts that in the short run border closures translate directly into spikes in unemployment in the absence of a wage adjustment in the Palestinian labor market. However Mansour (2010) finds some wage decline for unskilled workers in the West Bank as a response of increases in the supply of skilled workers expelled by the Israeli labor market, suggesting that those skilled workers competed locally for low-skilled jobs.[9] Benmelech et al. (2011) find evidence of adverse labor market effects of Palestinian suicide attacks inside Israel in the perpetrators' district of origin. They associate these results at least in part to increased Israeli restrictions on the district, including movement restrictions, following the attacks. We complement this literature by specifically examining the effects of mobility restrictions within the oPt while controlling for the concomitant effects of external closure as well.

Finally this paper is also related to the literature on the economic impact of the changes in transport and trade costs within countries, whose main focus is on the impact evaluation of transport infrastructure improvements. A natural outcome of such improvements should be the increase in trade between the newly connected regions, which in turn has implication for welfare as well as for the distribution of income. Donaldson (2012) and Faber (2012) find that large

[7] Angrist (1995 and 1996) provide some seminal analyses of the Palestinian labor market.
[8] According to the Israeli Central Bureau of Statistics, about 60% of foreign immigrants have been allocated in the same industrial jobs used to be occupied by Palestinians. This pattern was substantial in the period 1995-2005, and explains a good part of the decrease in demand for unskilled Palestinian labor in Israel after the second Intifada.
[9] Some evidence is also emerging on other labor market effects of the conflict. For example Miaari, Zussman and Zussman, (2012a) find that the second Intifada increase the extent of job separation between Arab and Jewish workers within Israeli firms.

transport infrastructure improvements significantly increased trade between regions in British India and in China respectively. Both studies identify large welfare gains from such increased trade, although the findings on China suggest asymmetry in the distribution of these gains with the economic activity shifting to the more industrialised regions. Michaels (2008) examines the impact of increased trade due to the highway construction on the demand for skills across US counties. Other studies focus on the improvement in the accessibility to employment that such types of transport infrastructure development are likely to bring about. Baum-Snow (2010) examines the changes in commuting patterns brought about by highways development in the USA. Sanchis-Guarner (2012) looks at the effects of road construction on employment probability, working time and wages in Great Britain via higher accessibility to employment. Gutierrez-i-Puigarnau and van Ommeren (2010) study the effect of changes in commuting time on the labor supply exploiting the relocation of the establishment within the same firm. They find that an increase in commuting time reduces the average number of days worked per month and raises the average daily hours worked. Our analysis exploits a very different source of changes in trade cost and accessibility to employment. Such changes prove to be much more abrupt and frequent than the kind of changes the literature has been examining, but with analytically similar effects.

The rest of the paper is organized as follows. Section 2 provides a brief account on the conflict with a specific focus on the development of the barriers' system in the West Bank; section 3 discusses the channels through which such barriers may affect labor market outcomes; section 4 describes the data and the empirical strategy; section 5 discusses the estimation results and section 6 concludes.

2. Barriers and mobility restrictions in the West Bank

Restrictions to the mobility of goods and labor across Palestinian borders have been a defining feature of the Israeli occupation of the Palestinian territory especially since the outbreak of the first Intifada in 1987. Spurred by security concerns, such measures involved periodic closures of the West Bank and Gaza Strip concomitant with surges, or expected surges, in the Israeli–Palestinian conflict (Miaari and Sauer, 2011). Along with these restrictions Israel introduced also a system of check-points that constrained the movement of goods and people

between areas within the West Bank and Gaza as well as on the access to certain areas of the West Bank. This system was loosely enforced throughout the 1990s not representing a serious obstacle to mobility within the regions of the oPt. In fact following the beginning of the Oslo peace process in 1993 many check-points were removed.

However after the outbreak of the second Intifada in September 2000, Israel severely scaled up the restrictions on the mobility of Palestinian goods and people within the oPt as well as towards Israel. Israel also started the construction of a separation wall (West Bank wall henceforth) in 2002 with the declared intent of restricting the movement of Palestinians from the West Bank into Israel for security reasons.[10] The system of movement and access restrictions within the oPt (the 'internal closure') became particularly severe within the West Bank and that is the focus of our study focuses.[11] According to the Israeli army, this system has been devised as a security measure "to protect its citizens" (both inside Israeli settlements in the West Bank and in Israel proper) from attacks originating in the West Bank (IDF Military Advocate General, 2012). This feature is important for our identification strategy, as it ensures that the placement of these barriers is exogenous to local labor market conditions. We provide further evidence below that changes in these conditions are indeed not associated with subsequent barriers' placement.

The system of movement and access restrictions in the West Bank has taken a multitude of forms and is still operational today (2007b). It has been enforced through a web of manned and unmanned physical barriers placed by the Israeli army on roads and at the entrance of villages, towns and cities. These barriers include permanent and partial check-points, which usually control the access to main roads, roadblocks, earth mounds, road gates, barrier gates, agricultural gates, trenches and earth walls. Such barriers increase dramatically the travelling time between cities, villages and rural areas, forcing vehicles to making detours over fields or unpaved roads.[12] These delays translate also into higher direct costs of travelling between areas of the West Bank.

The barriers have been varying across space and time. According to the data collected by ARIJ, their number increased along with the intensity of the conflict in the early 2000s and then

[10] Even before the construction of the wall, and as a response to the outbreak of the second Intifada, the number of Palestinian workers commuting to Israel dropped sharply between 2000 and 2002 (Miaari, Zussman and Zussman, 2012b).

[11] In the remainder of the paper we use interchangeably the terms closures and barriers.

[12] For example the travelling time between the city of Bethlehem (just south of Jerusalem) and Ramallah (just north of Jerusalem) has more than doubled since Palestinian vehicles were not allowed to take the most direct route via East Jerusalem (Palestinian Ministry of National Economy and ARIJ, 2011).

peaked in 2007-08, when they started to decrease slowly. In 2009 our data record 89 checkpoints, 268 roadblocks and earth mounds and 122 barrier gates. The trend in the number of checkpoints between 2000 and 2009 is similar to that of the other barriers, showing a steady increase until 2008 when the number started to decline (Figure 1).[13] In the analysis we exploit this variation over time and across small spatial units in the West Bank to identify the impact of these barriers on local labor markets.

While the system of internal closures was not targeted on the basis of local economic conditions, it did (and still does) however have large effects on the local economy. Virtually all reports on the Palestinian economy in the last decade have argued that the movement and access restrictions are a key constraint to Palestinian economic development (e.g. World Bank (2004, 2007a, 2010 and 2011a), IMF (2010), UNCTAD (2011)). Internal closures stifle economic activity by raising the cost of doing business and increasing uncertainty (World Bank 2004, 2007a, 2007b). The closure system has fragmented the West Bank territory into small and disconnected "cantons" (World Bank, 2007b). A recent World Bank (2011b) study finds that the checkpoints have a significant and large positive effect on spatial price differences in the West Bank. The lower bound estimate of the effect of two or more checkpoints between cities is an added price difference of up to 10 percent, which is comparable to the transaction costs incurred when crossing the U.S.-Canada border. These types of effects are even larger during periods of curfew when "the wheels of the economy come to a grinding halt." (World Bank, 2004, p.1). Despite the importance of the barriers to mobility for the Palestinian economy, there has not been a systematic quantification of the extent to which these closures have affected the welfare of the Palestinian labor force.

3. Theoretical considerations

How are the physical barriers to mobility expected to affect labor market outcomes? It is useful to distinguish between a direct and an indirect channel through which the barriers impact the labor market. The direct channel is related to the role of the barriers in constraining the

[13] The only exception is the drop in 2004, which may be partly due to incomplete reporting as that was the first year in which OCHA started recording the closure data. For this reason we also check the robustness of the results below to excluding the year 2004 from the analysis. All the results are virtually unchanged to this exclusion (results available from the authors upon request).

workers' ability to reach their workplace. This mechanism raises the time and often the cost of commuting for those working in a location whose access from their place of residence is constrained by the presence of a barrier. The closures force these workers to take alternative longer routes than the most direct ones (thus raising both the cost and the time of commuting) or they slow down the workers' speed over the same route (thus raising only the time of commuting). In certain instances the barriers may even prevent the workers to reach their work location altogether (e.g. during curfews). We abstract here from the eventual changes in residential location by the workers induced by the barriers' placement in order to mimic more closely the West Bank context.[14]

The second mechanism through which the barriers may display their effects on the labor market is by affecting the firms' profitability due to the restrictions on the mobility of goods and labor across locations. These restrictions increase the cost of internal and external trade as well as the cost of labor. This mechanism would increase the degree of autarchy of the locations, since goods from outside the location would become more costly. Indeed the share of firms' sales outside of their own areas in the West Bank dropped from 58% to 41% between 2000 and 2005, a period of increasing Israeli imposed mobility restrictions (World Bank, 2007a).[15] The restrictions imposed by the barriers would also raise the cost and the availability of production inputs, which are overwhelmingly sourced from outside the location and often outside of the West Bank.[16] In a simple framework where firms are price-takers, these effects reduce firms' production, revenues and employment by raising the costs of inputs and transport. By constantly shifting the intensity of the restrictions, the system of closures also creates uncertainty in terms of the cost and the time of the flow of goods and labor, which by itself is an extra cost to the firms. In a world of increasing returns to scale these restrictions would also force firms to operate at a less than efficient scale of production by reducing their size. These types of effects are akin to the costs of increased autarky between locations. The importance of such costs is captured in Donaldson (2010), who shows that the large welfare gains of connecting Indian districts through the railway system during the British times are fully explained by the increase in the share of

[14] As noted by Mansour (2010) the traditional structure of the Palestinian society and the period of instability we consider suggest that change of residence by workers is unlikely to be common. This is confirmed by the analysis of the data below. In addition we keep the residential location fixed in some empirical specifications.
[15] Areas in the West Bank are defined by the study into three types: Northern, Central and Southern West Bank.
[16] The production inputs also include labor, whose cost and availability is also raised by the barriers. However, unlike the physical production inputs, labor in the West Bank is mainly sourced within the firm's location.

goods sourced from outside of the district.

We examine in turn the way in which each of these two mechanisms affects the three main variables that define the labor market, i.e. employment status, wages and labor supply.

Employment status

In a standard match searching model, the increase in commuting time and/or distance would make working outside one's location of residence less attractive or in certain instances not possible at all. This potentially reduces the range of work options available to each worker (Gibbons and Machin, 2006). In addition it would also decrease the probability of finding employment by reducing the unemployed worker's effort to look for a job as the search becomes more costly (Patacchini and Zenou 2005).

While these effects should unambiguously reduce the probability of being employed outside the worker's own location, they do not entail clear predictions on the overall probability of being employed. If we take the extreme case of barriers impeding any mobility between locations, everyone will have to work in her own location. Other things being equal, those locations which before the restrictions enjoyed a positive net emigration rate (i.e. net exporters of labor) will experience an expansion of the labor supply following the closure. This happens as more residents will look for a job in the location than the number of non residents who will not work in the location any longer. Keeping the labor demand curve constant, this expansion should reduce the probability of being employed in those locations. The opposite will be true for locations where the net emigration rate was negative before the barriers' placement.

However the labor demand curve does not stay constant due to the indirect effect of the internal closures, which reduces the firms' need for labor, as production and revenues decline as described above. Therefore this indirect channel would unambiguously predict that the barriers should reduce the probability of being employed in all locations.

Wages

Higher commuting costs due to the barriers expand the wedge between the 'net' wage a worker receives and the 'gross' wage paid by the employers. There is some evidence especially in the urban economics literature that employers tend to compensate the workers for the commuting costs in which they incur (see Gibbons and Machin, 2006 for a review). To the extent

that this 'wage gradient' rule applies to our context, the direct effect of the barriers on the workers' wages (conditional on being employed and on reaching the workplace) may then be positive. However higher commuting costs make it more difficult to match different types of workers and different types of employer, thus the probability of unproductive matches (along with the associated lower wage) may increase.

The indirect channel of the closures would unambiguously reduce the wages that firms can pay to the workers for at least two reasons. First to the extent that these restrictions prevent the firms from achieving an efficient scale of production, other things being equal this would reduce the productivity of labor. Second, by increasing the costs of many of the inputs, the barriers would reduce the remuneration that can be paid to the other factors of production, including labor.

Labor supply

The direct effect of the closures again concerns only those workers who do not work in their location of residence. This effect restricts the ability of workers to supply labor by making it impossible to reach their workplace or by increasing the costs and time to reach it. Given this type of effect it is useful to split the labor supply into two contemporaneous labor supply decisions of the workers: how many days (over a certain period of time) and how many hours per day (conditional on going to work) are worked. This distinction makes sense in the presence of fixed commuting costs per day (Gutierrez-i Puigarnau and van Ommeren, 2010), which is the case treated here. This decision however is not entirely voluntary in this case given that the fixed costs of commuting are in certain days (i.e. during severe closures) prohibitive. For this reason the direct effect of the barriers is expected to reduce the number of days worked over a period of time. This prediction is also consistent with the recent theoretical and empirical evidence on the effect of an increase in commuting costs and time. Gutierrez-i Puigarnau and van Ommeren (2010) show that an increase in daily commuting time induces workers to reduce their overall commuting time by reducing the number of workdays. On the other hand once the worker reaches the workplace she may want to work more hours to compensate for the lower number of working days. Therefore the direct effect of closures may be positive on the hours worked per day conditional on the worker reaching the workplace, a prediction confirmed by the evidence in Gutierrez-i Puigarnau and van Ommeren (2010).

Again, the indirect channel of closure is expected to have a negative impact on the number of hours and days worked as the firms' production and demand for labor decline. While a sizable share of the labor adjustment by the firms following the fall in production could happen by downscaling employment (as argued above), some adjustment could also occur via a reduction in the average per worker labor inputs. The empirical analysis below explores to what extent that is the case.

4. Data

The bulk of our data comes from two main sources: labor force surveys data collected by the Palestinian Central Bureau of Statistics (PCBS) and georeferenced data on various types of physical barriers to movement over time collected by ARIJ. We also complement the latter data with data collected by OCHA.

The Palestinian Labor Force Survey (PLFS) of the West Bank and Gaza Strip began in 1995 following the creation of the Palestinian Authority (PA) and since then it has been administered every quarter to a nationally representative sample of households. The PLFS surveys each household four times over a period of six quarters: each household stays in the sample for two consecutive quarters, and after a break of two quarters it returns to the sample for two more consecutive quarters. Households are subsequently dropped from the sample. This feature is important as it allows us to generate a panel of individuals over time. Each survey round after 1998 contains approximately 1,300 households in the West Bank. Our sample in the analysis below consists of more than 45,000 individuals over the period considered.

We restrict the sample from the PLFS to individuals in the labor force between the ages of 15 and 64 and surveyed during the forty-four quarters between quarter one of 2000 and quarter four of 2009. The rounds of the survey prior to 2000 are not considered as the data on the barriers for that period are available only for the year 1995, when the methodology of the PLFS sample design was substantially different.[17]

The PLFS data includes information on various individuals' personal characteristics, such as age, marital status and education, labor market variables, including employment status, daily

[17] In 1995 the survey was conducted in one quarter only and it was an experimental sample.

wage, number of days worked in the previous month, hours worked in the previous week, occupation and industry, as well as the households' locality of residence and the locality of work place. The latter geographical data is a key element to identify the effects of the closures on the labor market variables. Localities represent the smallest spatial unit for which economic data is available in the West Bank and provide a very refined spatial scale for our analysis. There are 660 localities defined by the PCBS in the West Bank with an average size of 8.5 Km^2. Of these localities we exclude the 17 localities part of the Jerusalem district for which the barriers do not affect the access to the Israeli labor market. In addition half of the remaining localities are not surveyed by the PLFS during the period of analysis as they have no or tiny Palestinian population. In the end our sample consists of 321 localities.

Yearly data on the physical barriers for the years 2000, 2001, 2003, 2006, 2008 and 2009 comes from ARIJ and we complement them with data from OCHA for the remaining years in the period 2000-2009, except for the year 2002 for which data is not available due to the severe unrest occurring in the West Bank in that year.[18] We have data on the most important types of barriers, including permanent check-points, partial checkpoints, roadblocks, earth mounds, road gates, agricultural and barrier gates.[19]

Checkpoints are infrastructures which inhibit vehicular and pedestrian traffic and are manned by Israeli security personnel, which usually check the documentation of persons crossing the checkpoint and conduct searches on their vehicles and belongings. Unlike permanent checkpoints, partial checkpoints are only occasionally manned. Earth mounds are mounds of rubble, dirt and/or rocks put in place by the Israeli army (IDF) to prevent vehicular movement along a road (usually secondary) or a track. Earth mounds are often removed or circumvented and then re-built and/or enlarged (OCHA, 2010). Roadblocks are constructed from one or more concrete blocks of about one cubic meter. Similarly to earthmounds, they are also used to prevent vehicle access to land or roads often at the entrance of villages, towns and cities.

[18] We do not have the date in which the barriers were placed in each year so we assume that each barrier has been there since the beginning of the year if observed in that year. This limitation of our data may give rise to some measurement error, which should however be minimized by the fact that the vast majority of the barriers in every year have been present since the beginning of that year.

[19] Data on other types of barriers, including road barriers, trenches and earth walls is not consistently available over the period of analysis due to the difficulty in monitoring such barriers and is therefore excluded from the analysis. While this may generate some omitted variable bias, its size should be relatively small as these represent minor obstructions and their placement may reflect to some extent that of the other barriers.

Agricultural gates and barrier gates are metal gates which provide the only access through the West Bank wall to the so-called "seam zone". This is an area comprised between the internationally recognized border between the West Bank and Israel (the "green line" in Figure 2) and the wall (the solid black line in Figure 2), which is almost entirely constructed inside the West Bank territory and whose total length upon completion will be 760 Km. The "seam zone" comprises around 8.5% of the West Bank and includes a number of villages and several hectares of agricultural land, which have been cut off from the rest of the West Bank by the wall. These gates usually require permission to be crossed and have specific opening times which may vary over time. Agricultural gates are used mainly by the owners of the land in the "seam zone" who live on the other side of the wall, while barrier gates are used by the residents of the villages in the "seam zone" to access the rest of the West Bank and by lorries transporting goods from the West Bank into the "seam zone". The last type of barrier in our dataset is road gates. These are metal gates used to block access to a route and similarly to the other gates usually have varying opening times. For each barrier observed in a specific year, we have information on its geographical coordinates and type. Figure 2 shows a map of the West Bank including the check-points (both permanent and partial) along with the localities' centroids in 2007. It is clear from the figure that these barriers were spread all over the West Bank territory thus affecting virtually all movements within the region.

ARIJ also collected data on the length of the wall built for each West Bank village crossed by the path of the wall for the years 2002, 2004, 2006, 2008 and 2010. In cases in which a village contains more than one locality, we assign a quota of the village's length of the wall to each locality on the basis of the share of the village's areas covered by that locality. We use linear interpolation to obtain the data on the wall length for the missing years.

Data on the number of Palestinians fatalities in each locality since 2000 are taken from B'Tselem, The Israeli Information Center for Human Rights in the Occupied Territories.[20] Widely thought to be accurate and reliable, the data published by B'Tselem record in detail every fatality on both sides during the Second Intifada. Finally the data on the size of localities' labor markets before our period of analysis come from the 1997 Palestinian population census administered by the PCBS. Summary statistics for key variables are provided in Table 1.

[20] Available at: http://www.btselem.org.

5. Estimation Strategy

The identification of the effects of the barriers on the labor market relies on time varying measures of the 'closeness' of the physical barriers from the individual's locality of residence, which proxies for the intensity of the restrictions imposed by the barriers. The main measure we use is constructed as the count of the barriers within 30 minutes of travel time (by existing roads) from the locality's centroid, weighted by the inverse of their travel time.[21] This weight captures the idea that the more distant a checkpoint is (taking into account the road system) the less it will affect mobility to and from a certain locality. More formally:

$$PB_{lt}^{30\,\min} = \sum_{b \in N_{lt}} \left(\frac{1}{d_{bl}^{time}} \right) \qquad \left\{ b \in N_{lt} : d_{bl}^{time} \leq 30 \right\} \qquad (1)$$

where d_{bl}^{time} is the travel time by road in minutes of barrier *b* from location *l* in year t and N is the location-specific number of barriers that satisfy the travel time limit of 30 minutes. Figure 3 presents a map of the area comprising roughly a 30 minutes travel time band around Nablus' locality, which includes all of the elements involved in the computation of the index, i.e. barriers, localities' centroids and the road system. This travel time threshold should ensure that we capture all of the main relevant barriers affecting the economic life of each locality. In addition, the travel time weight ensures that barriers further away would have a limited effect on the index even if included. Nonetheless this remains an arbitrary distance band. As this variable is key to identify the closures' effects, we also implement different approaches to construct *PB* to minimize the concern that the results may be driven by a specific way to compute the measure. The first variant of the index relies on using physical distance rather than travel time as the weight. Therefore we construct the same index as in (1) but replacing d_{bl}^{time} with d_{bl}^{road} which is measured in minutes. As further variants of the same approach, we also use 20 minutes and 20 Km as the travel time and the road distance bands to construct the alternative indices. We also compute an index as in (1) but without the distance weights, thus relaxing the assumption of variation in the barriers' effects within 30 minutes (or 30 Km). It could also be the case that the

[21] We use the network analysis algorithm in ArcGIS in order to compute the distance and the travel time between the locality's centroid and each barrier. The computation is based on georeferenced data on the existing road network in the West Bank in 2001 (which has not changed over the period of analysis). The model takes into account also the ruggedness of the terrain to compute the speed over the road network, which is necessary to calculate the travel time.

closest *n* barriers rather than those within a distance boundary are those mostly constraining the mobility related to a specific locality. In order to account for this possibility, we also experiment with a variant of the index, which considers only the closest 5 barriers from each locality by travel time: $PB_{lt}^{5bar} = \sum_{b=1}^{5}\left(\frac{1}{d_{bl}^{time}}\right)$.

We employ the index of closeness to the physical barriers thus constructed to measure the reduced form effect of the mobility restrictions on labor market outcomes. The baseline regression reads as follow:

$$lm_{ilqt} = \alpha + \beta PB_{lt} + \Theta X_{iqt} + \mu_i + \gamma_{qt} + \varepsilon_{ilqt} \qquad (2)$$

where lm_{ilqt} is one of the labor market variables we are considering (i.e. dummy for being employed, log of hourly earnings , log of number of working days in the preceding month or log of the number of working hours per day in the preceding week) for individual *i* in location *l* in quarter *q* and year *t*; *X* is a vector of time varying individual characteristics, including age, its squared, years of schooling and marital status, and occupation variables, including tenure, sector and a set of workplace dummies (Israel, settlements and outside of own district in the West Bank); μ are individual fixed effects (FE) and γ are time (quarter-year) effects. The latter capture all the time varying shocks common to all the individuals throughout the West Bank, such as the political context, the evolution of the Palestinian economy, etc.; ε is the error term. Using this FE specification implies that the main source of identification comes from the within group variation in *PB* and *LM* variables. Given the type of data we use, β measures the changes in the individual's labor market outcome associated with the change in the barrier index that she is exposed to (because of resident of a specific locality) from one year to the next.

As mentioned above, in the absence of a sample counterfactual localities (whether different localities at the same point in time or the same locality at a different point in time) which is not affected by the barriers, β is more correctly interpreted as the *marginal* rather than the *total* effect of the barriers. This estimate is likely to be an under-estimation of the actual labor market effect of the closures, as we are not able to take into account the general equilibrium effects of closures. For instance the analysis does not capture the negative effects of a closure on

one locality via other localities. If production costs in locality *x* are increased by the presence of a checkpoint C nearby, and part of *x* production is used as inputs in locality z, then C would have a negative impact on *z* via *z*'s backward linkages. This problem is hardly escapable in contexts such as the West Bank, where even the residents of more peaceful regions are adversely affected by conflict related disruptions (Blattman and Miguel, 2010).

Running (2) with FE estimation involves using a linear probability model (LPM) for the specification with the employed dummy as the dependent variable. We prefer using the LPM over alternative methods, such as probit or logit estimation, for a number of reasons. First, FE specifications are inconsistent in non-linear discrete models. Additionally, the estimation through LPM lends itself to a more straightforward interpretation of the results. The main drawback of using LPM is that it does not guarantee that the probability of the event occurring is bounded between 0 and 1. However this problem is marginal in this case, as there are very few cases in which the estimated probabilities were above 1 or below 0. The results reported below are qualitatively similar to those obtained using probit or logit models (results available from the authors upon request).

So far we have assumed that all the barriers have the same effect on the labor market. Although they all restrict movement, they do so in different ways and intensity. In particular, we find it convenient to split the existing barriers into two types according to the expected effect on the mobility that they may exert: checkpoints – both permanent and partial (*CP*), and road blocks, earth mounds and gates (*REG*), including road gates, barrier gates and agricultural gates. Checkpoints are manned barriers (partial checkpoints are only occasionally manned) and they have been used to restrict the movements over the main roads within and across the oPt. Because they obstruct important connections between localities, these barriers are expected to have a particularly relevant impact on the movement of goods and labor. The other types of barriers (*REG*) consist of mainly unmanned permanent obstructions placed on secondary roads and smaller paths and of gates placed on the wall to allow the transit to and from the "seam zone" as well as to and from Israel. Their restriction is expected to be less damaging than that of the checkpoints. Road-blocks and earth mounds can be overcome by alternative route, only slightly

more costly than the route they obstruct.[22] In addition most of the gates considered here connect to the seam zone as well as to Israel and allow the relatively unhindered transit to people and vehicles with permit.

In order to differentiate between the effects of these two groups of barriers, we modify regression (2) in the following way:

$$lm_{ilqt} = \alpha + \beta_1 CP_{lt} + \beta_2 REG_{lt} + \Theta X_{iqt} + \mu_i + \gamma_{qt} + \varepsilon_{ilqt} \qquad (3)$$

In the analysis below we also check the robustness of the regression to a variety of further time varying controls at the locality level, including the length of the constructed West Bank wall, the Palestinian fatalities, the number of and the share of employment in Israel and Israeli settlements in the year before, as well as the sectoral level.

5.1 Exogeneity

Our main identifying assumption in (2) and (3) is that the placement of physical barriers by Israel is exogenous to the local labor markets in the West Bank. We can identify three possible ways in which this assumption may be violated in our framework. First it may be that individuals respond to the placement of barriers by changing residential location. If this decision is correlated with certain characteristics which influence the labor market outcomes as well (e.g. unobserved ability) then the estimated β coefficients would be biased. In our estimation this problem would arise if individuals change locality of residence during the period they are monitored by the survey (six quarters). This is the case for only 120 workers (out of 48,000) in our sample. Importantly, excluding these individuals does not change our results below in any meaningful way (results available from the authors upon request).

Second, it could be the case that certain unobserved locality's characteristics may be related to both labor market outcomes and internal closures. The FE specification captures these possible locality characteristics as long as they are time invariant.[23] However there could also be

[22] There are a few exceptions to this general rule with road blocks obstructing important passages into towns and cities which may severely increase the congestion on the alternative routes.

[23] In fact as long as there are individuals who move locality of residence in the sample, the FE do not capture all of these characteristics. Adding explicitly locality FE to control for that does not change the results (results available upon request). As this addition reduces the degrees of freedom of the model without improving the efficiency of the estimation, we do not include locality FE in the specifications with individual FE.

time varying variables which may drive both the placement of barriers and the labor market. In particular, the intensity of the conflict at the locality level is likely to be the main such variable. Locations which are characterised by more violence are likely to experience an increase in barriers to movement as well as a deterioration of their labor market conditions. In order to deal with this possible source of bias we use the Palestinian fatalities in each locality in the previous quarter. This variable is arguably the closest proxy to the intensity of the conflict available and has already been used to that end (e.g. Miaari, Zussman and Zussman, 2012b).[24]

The last possible way in which the exogeneity assumption may be violated is due to reverse causality, i.e. the changes in labor conditions drive the placement of barriers by Israel in the West Bank. This channel does not seem to apply in this case, at least according to the Israeli authorities, which, as discussed above, claim to impose these barriers exclusively on the basis of security considerations. It is the desire to protect Israeli citizens, whether in West Bank settlements or within the internationally recognised borders of Israel, that motivates the placement of checkpoints and other barriers in the West Bank by Israel. This motivation bears no relationship with local economic conditions, including the labor market. In order to provide further evidence on the absence of this reverse causality channel, we examine whether changes in local labor market conditions over the last two quarters of each year are correlated with changes in the barriers' variables in the following year:

$$\Delta PB_{lt+1} = \alpha + \phi_1(emp_{lq4t} - emp_{lq3t}) + \phi_2(w_{lq4t} - w_{lq3t}) + \phi_3(h_{lq4t} - h_{lq3t}) +$$
$$+ \phi_4(f_{lq4t} - f_{lq3t}) + \lambda_l + \gamma_t + \varepsilon_{lt} \qquad (4)$$

Where $\Delta PB_{lt+1} = PB_{lt+1} - PB_{lt}$, *emp*, *w* and *h* are the employment rate, the average hourly wage and the hours worked per week in locality *l* respectively, *f* is the number of fatalities and λ is locality fixed effects. We run the same specification also for the other measures of barriers. We use employment, wages and hours per week, which combines the two labor supply measures we use in (2) and (3), as the main variables defining the local labor markets.

The results are presented in Table 2 and confirm that changes in local labor market

[24] Following the results in Benmelech et al. (2011) we also include as a further control the number of Palestinian suicide attackers into Israel from each locality lagged one year. This inclusion does not affect any of the results below and due to potential endogeneity concerns we decide to exclude this variable from the reported regressions below (results available upon request).

conditions are not statistically related to subsequent decisions by Israel to place barriers to mobility. The labor market variables are never significant, either when included by themselves (columns 1-3), or when included jointly (columns 4-6). These variables' lack of significance carries through also to the specifications using checkpoints (column 5) and other barriers (column 6) as dependent variables. Taken together these results strongly support the exogeneity of the barriers to mobility to the labor market conditions, which gives us confidence on the reliability of the results of the following analysis.

6. Estimation Results

The results from the baseline specifications (2) and (3) are presented in Table 3. The standard errors are robust to heteroscedasticity (using the Huber-White correction) and are clustered at the individual level. Although not shown here, the significance of the coefficients is also robust to clustering at the household level, which accounts for the possible influence of labor market variables of other household members. The results are largely consistent with the theoretical priors. The internal closures have a negative and strongly significant effect on employment (column 1). This effect is essentially driven by the checkpoint coefficient (column 2), which suggests that adding one checkpoint a minute away from the locality decreases the probability of being employed by half percentage point. Despite being an under-estimation of the actual effects of the barriers, the effect is not negligible. For example, considering that the average value (weighted by the population) of CP^{30min} was 1.59 in 2007, the presence of checkpoints translates into a 0.72 percentage point decrease in the West Bank employment. On the other hand the negative effect of the other barriers on employment is much smaller, confirming that these types of restriction represent less severe obstacles to the mobility within the West Bank relative to checkpoints.

The check-points also lower the (hourly) wage among those in employment. The negative impact of the physical barriers on wages, which is not significant at standard levels (column 3), is entirely driven by the check-points to an even larger extent than in the case of employment (column 4). Placing one extra check-point one minute away from the locality reduces the hourly wage by 5.2%. The effect of the check-points on wages is therefore considerably larger than that on employment, suggesting that the labor markets have adjusted to the restrictions through lower wages rather than through lower employment. The other barriers again exert no discernible effect

on the wages. The check-points also affect the supply of labor. Similarly to the other labor market variables, the barriers' effect on the labor supply indicators is driven by the check-points, while the other barriers do not exert a significant effect on the labor supply. In particular, the presence of check-points reduces the number of days worked (column 6), while it increases the number of hours worked in a day conditional on going to work (column 8). The former result is potentially consistent with both the direct and indirect channels of the check-points: workers reduce the number of working days due to the increased commuting costs, and firms reduce the average per worker labor inputs in order to adjust to the decrease in production due to the mobility restrictions.

As mentioned above, the assumption of the distance threshold beyond which the barriers are not considered to have an effect on the labor market is arbitrary. We construct a number of different measures for the barrier variables as described in section 5, always obtaining similar results to those in Table 3. For the sake of space we only report the results using the barriers' index defined in terms of road distance rather than travel time. In Table 4 we replicate the regressions in Table 3 but using PB^{30Km}, CP^{30Km} and REG^{30Km} instead. The results are qualitatively unchanged.

Given the highly heterogeneous effect of the two groups of barriers, in the remainder of the analysis we use only *CP* and *REG* rather than *PB* as the main regressors of interest. While the use of time effects helps us control for the impact of the changing conflict intensity throughout the West Bank, the intensity and impact of the conflict is likely to vary across locations over time. In Table 5 we address this possible issue by adding a set of time varying controls at the locality level. First, we include the number of Palestinian fatalities in the previous quarter, which to our knowledge is the best available measure of the conflict intensity in this context. As explained above, this variable is particularly important to address endogenity concerns of the barriers' indices due to omitted variable.

Second, we add the length of constructed West Bank wall (in Km) in the locality in order to capture different short-term labor market effects of the wall construction during our period of analysis. The wall obstructs the entrance of Palestinian workers to the informal Israeli labor market; in addition, it makes it more difficult for the landowners and their workers to access their land in the "seam zone"; on the other hand, the construction of the wall also provides an unskilled work opportunity for the local Palestinian labor force in the short-term.

Third, we also add the share of the locality's labor force employed in Israel and the settlement in the previous quarter. The inclusion of this variable aims to control for the short-run adjustment of local labor markets following the swings in the inflows of West Bank workers previously employed in Israel. As a consequence of the sraeli closure of the borders between the West Bank and Israel these workers eventually became unable to commute to their jobs in Israel (Mansour, 2010).

The check-point coefficients are highly robust to the inclusion of these variables with no significant change of the effect of the check-points on any of the labor market variables (Table 5, odd columns). The coefficients of the other barriers are also relatively unaffected by this inclusion and their effects remain not significant at standard levels. Even their effect on employment becomes now not significant (column 1), although it remains negative. Expectedly, the number of Palestinian fatalities in one quarter is associated with a statistically significant reduction of employment probability in the next quarter.[25] On the other hand the variable is not significantly related to the other labor market variables. The effect of the West Bank wall on the employment probability is positive albeit very small, suggesting that the employment opportunities channel of the wall construction slightly prevails over the others in the short-run. In the longer run, once the construction is completed, only the negative effects of the wall on the labor market are likely to play a role. The construction of the wall has a negative impact on wages (column 3), consistently with the idea that the type of employment generated is relatively unskilled, while it has no discernible influence on the labor supply. The share of workers employed in Israel has a negative impact on employment in the following quarter. This finding is consistent with Mansour's (2010) result that a larger incidence of workers employed in Israel was associated with subsequent larger increases in the local labor supply in the West Bank. On the other hand, a higher share of employed in Israel slightly increases the hourly wage in the next period, which suggests that the wage differential between Israel and West Bank labor markets may have induced a higher reservation wage at the local level.

There may also be concerns that unobserved sector specific shocks could affect labor markets and, indirectly, closures as well. In order to address this concern we add to the analysis a series of sector-time dummies, which capture those time varying shocks common to all

[25] We also use the quarterly number of attacks perpetrated inside Israel and originating in each West Bank district to further control for the conflict channel. The results, available upon request, are again robust to the inclusion of this variable.

employees of one sector. To that end we group the sectors into the three standard macro categories: manufacturing, agriculture and services. The results, reported in the even columns of table 5, are robust to this inclusion. In fact the absolute magnitude of the checkpoint coefficients increases in all cases except for employment probability, while the standard errors remain the same.

6.1 Disentangling the channels

The results so far capture the reduced form effects of physical barriers on the labor market. As discussed in section 3, there are two types of channels that may be driving these effects: the direct channel of the barriers restricting the workers' movements; and the more indirect channel through the harmful effects of the barriers on firms' profitability and demand for labor. Although we do not have data on firms to explicitly test for the latter channel, we can employ two strategies in order to isolate the former channel. The first consists of isolating the impact of the closures on those workers with relatively long commute to the workplace. These workers should be affected by the barriers differently from the others through the movement restriction channel. Therefore we add to the specification in table 5 the interaction between the dummy for the workplace being outside the own district of residence (commuters henceforth) and the barrier variables. The district is a much larger spatial unit than the locality, with an average size of over 500 Km^2. Therefore commuters are most likely to face a relatively long commute to the workplace, which almost invariably is hindered by some closures during the period of analysis. This ensures that this interaction term captures some of the direct effects of the closures on the ability of the workers to reach their workplace. However this is an incomplete measurement of such effect as it does not include those workers whose place of work is in a locality different from their residence but within the same district. Using an out of locality (rather than out of district) dummy would address this issue but the information on the locality of the workplace is available only for half of the rounds and thus we use it only as a robustness check.

Table 6 presents the results. As expected the check-points have a more negative effect on the probability of being employed for commuters than non-commuters (column 1). Conversely the other closures have a less negative effect on employment for these workers. As shown in column (2), this effect is driven by the impact of the other closures on the commuters to Israel. These workers actually benefit from being closer to the barrier and agricultural gates which are

the main ways through which they can reach their workplace in Israel. Once we include these interaction effects, the size of the checkpoint coefficient on employment decreases only by a quarter, while the other barriers' coefficient increases in absolute size and becomes more significant (cf. column 1 in table 6 with column 2 in table 5). To the extent that these interaction effects capture the movement restriction channel of the closures, the results suggest that only a little portion of the labor market impact of the barriers is mediated via this channel.

Similarly, the checkpoint effect on hourly wages changes little once we account for the differential impact of the checkpoints on the commuters (column 3 in table 6 vs. column 4 in table 5). In this instance neither the checkpoints nor the other barriers have a statistically different impact on the wage of the commuters vis-à-vis the non commuters.

Similarly to the other variables, accounting for the differential impact of the closures on the commuters changes little the checkpoint and the other barriers' effects on the labor supply variables (cf. columns 4 and 5 in Table 6 with columns 6 and 8 in Table 5). Again this result suggests that the bulk of the impact of the closures is not explained by the direct channel via the restrictions to workers' mobility. Consistently with this finding, there is no differential impact of checkpoints and other barriers on the number of days worked (column 4) and that is the case also when distinguishing between commuters to Israel and to the West Bank (not shown here). On the other hand check-points have a more negative effect on the hours worked per day (conditional reaching the workplace) for the commuters (column 5). This result suggests that the extra commuting time caused by the checkpoints for workers with long commutes is large enough to compress their working time once they reach the workplace. Such finding is different from that of Gutierrez-i-Puigarnau and van Ommeren (2010) described in section 3. This difference may be due to the fact that the latter look at the effects of small increases in commuting time relatively to our context.[26] The results using the out of locality (instead of out of district) interaction are not shown here but are also consistent with the effects of the barriers not being driven by their direct effect through the restriction on the mobility of workers. These results suggest that much of the positive effect of checkpoints on the number of hours worked per day is not due to the workers' decision as a response to the longer commute. Rather this effect seems

[26] In line with this interpretation, when we consider commuters out of their own locality, which includes also workers who commute within their district of residence and thus have shorter commutes, the differential effect of the checkpoints on the hours worked disappears (Results are not shown here but available from the authors).

more compatible with employers adjusting to the restrictions by concentrating the production over fewer days with more working hours per day.

The second method through which we try to isolate the direct mobility restriction effects of the closures on the labor market exploits the questions in the PLFS about the labor supply decisions of workers. In particular, the questionnaire asks to the relevant workers why they were absent from work in the previous week. For each locality in each quarter we compute the share of respondents who reported closure as the reason for their absence. We use this share as a proxy for the extent to which closures restrict workers' ability to reach their workplace in each locality and quarter. In column (1) of table 7 we present the results of adding this variable to the employment regression. As expected this share has a negative and significant effect on employment probability. In line with the results in table 6, this addition reduces little the absolute size of the checkpoint coefficient (from -0.0041 to -0.0039), confirming once again that the direct effect of closures on workers' mobility explains only a tiny part of the negative effects of closures on employment. That is the case also for the checkpoints' impact on wages, which is unaffected by the addition of the new variable (column 2). The latter has a positive and significant association with wages, suggesting that employers pay a small premium to workers from locations which are disproportionately affected by the restrictions. The coefficient of checkpoints on the number of days worked is also unaffected by the inclusion of the new variable, which has a negative impact on the days worked in line with the results in table 6 (column 3). We obtain the same results also when we use a different variable to construct the proxy for the closures' restrictiveness on workers' mobility, i.e. the share of workers who reported closures as the reason for working less than 35 hours in the previous week (column 4). This variable is particularly relevant to measure the effects of the barriers via their restriction to mobility on the supply of labor.

We also use these two questions to generate two individual level dummies. The first takes the value of 1 if the worker's response to the question about her absence from work is "closure". Similarly the second takes the value of 1 for the same answer to the question about working less than 35 hours. The former dummy has the expected negative association with the number of days worked but again the size of the checkpoint coefficient is unchanged (column 5). The checkpoint coefficient is robust to the addition of these different variables also when the dependent variable is the number of hours worked per week (columns 6-8). The coefficients of the new variables are

negative and significant, implying that individuals in localities which are most affected by the closures' mobility restrictions and individuals who are mostly affected by restrictions work fewer hours per working day. This pattern confirms the findings from table 6 according to which the closures increase the number of hours worked per day due to the employers' rather than the workers' adjustment of the production to the restrictions.

Taken together, these results suggest that the direct effect of the closures in restricting workers' access to the workplace is responsible for only a small share of the labor market impact of closures in the West Bank. In the absence of adequate firm-level data we can only speculate that the bulk of the closures' effects may be driven by the other channel identified in section 3, i.e. the reduction in the firms' profitability and labor demand.

6.2 The effects of the barriers by type of locality

As discussed in section 3, the direct effect of the closures on employment should differ between localities which are net importer and net exporter of labor. To the extent that the closures reduce the mobility of workers, they should have a less detrimental effect on the labor market outcomes of workers residing in labor importing localities. We test for this prediction by computing net labor imports for each locality *l* in 2001, the first year for which the data allows to construct this variable, and interacting this term with the closure variables.[27] Although this variable may suffer from endogeneity bias as it refers to the year after the start of our analysis, it can still provide some interesting insight on the differential impact of the closures. The results in column (1), table 8 indicate that the checkpoints have a slightly less detrimental effect on the probability of being employed for workers residing in net labor importing localities in line with the expectations from section 3. On the other hand the opposite is true for roadblocks and other barriers. Consistently with the pattern in table 6, the latter result suggests that the direct effect for a worker to being close to these barriers is dominated by the increased access to the gates allowing the transit to Israel over the obstruction to the mobility between localities. Therefore labor-exporting localities whose access to the Israeli labor market is facilitated by the gates included in *REG* experience a slight increase in employment (i.e. the interaction term' negative sign in column 1). Again in line with the expectations, checkpoints have a less negative impact

[27] This is computed as the sum of all workers from any other localities *j* working in *l* minus the sum of all workers from *l* working outside of *l*, all divided by the total workers in *l*.

on wages and on the number of days worked for workers residing in net labor importing localities (column 2-3), while they have no differential impact on working hours (column 4). The other closures have no differential impact across localities on wages, working days and hours. To the extent that the two new interaction terms in columns (1)-(4) capture part of the direct effect of closures on employment, the unchanged checkpoint coefficients provide further confirmation that most of the labor market impact of checkpoints is not accounted for by the restrictions to workers' mobility.

The impact of the barriers across localities could also differ according to the size of the locality's labor market. Larger markets in a small economy like the West Bank are typically a reflection of economies of scale exploited by firms by serving the domestic market from a few locations. By breaking up the integration of this market, closures may be particularly detrimental for such larger labor markets. That is consistent with the results in column (5), where the interactions between the localities' number of employees in 1997 (according to the population census) and the barrier variables have a negative sign. The interactions' coefficients are not significant instead for the other labor market variables, except for working days (column 7), for which the interaction with the checkpoint is positive and significant. This result could suggest that residents in larger labor markets are less harmed by the checkpoints in reaching their workplace as they are more likely to work in the same locality.

6.3 Quantifying the overall marginal effects of the barriers

The estimated coefficients of the checkpoints allow us to provide a quantification of the marginal effects of the closures for the entire West Bank labor market. We compute the costs associated with these effects for the year 2007 and note that the results would be similar taking any of the other recent years in the sample. Given the results of the road blocks and the other barriers, which are not significant for the most part, we limit this quantification only to the checkpoints. The effects we capture refer to the difference in labor market outcomes between localities according to whether they are more or less surrounded by checkpoints. As explained above this difference provides a lower bound estimation of the actual total effect of the checkpoints.

We use the checkpoint coefficient column (2) in table 5 (-0.0041), which represents our preferred estimation, in order to compute the marginal effect of the checkpoints on employment

for the entire West Bank. As the average value of CP^{30min} in 2007 was 1.59 and the labor force was 1.05 million, the checkpoints were responsible for approximately 6,900 more unemployed workers in the West Bank in 2007. Considering the average daily wage and the average days worked per month, this effect translates into a monetary loss of New Israeli Shekel 150 million, or approximately USD 38 million.

We also use the checkpoint coefficient in column (4) (-0.0635) in order to compute the marginal effect of checkpoints on hourly wages. Using the average daily wage and the average number of days worked per month and accounting for the lower number of employed people just computed, the reduction in wages due to the checkpoints was equivalent to NIS 902 million, or approximately USD 229 million in 2007.

Finally the checkpoint coefficients in columns (6) and (8), along with the average number of days worked per month and the average daily wage allow us to compute the net marginal monetary effect of the checkpoints via the labor supply. This effect is slightly positive and turns out to be NIS 150 million or around USD 38 million.

These lower bound estimates suggest therefore that the overall cost of the checkpoints on the West Bank labor market amount to around USD 229 million, which is mainly determined by the reduction in the wages. This cost is far from negligible, equivalent to 6% of the West Bank GDP in 2007.

7. Conclusion

This paper has provided new evidence on the impact of mobility restrictions on the labor market in one of the most pervasive forms of such restrictions in modern times: the system of internal closures imposed by Israel in the West Bank in the 2000s. While the stated aim of the closures is to protect Israeli citizens from Palestinian attacks originating from the West Bank, the closures have a very significant impact on the West Bank economy. Using individual level regressions for a large sample of workers between 2000 and 2009, the paper finds that closures substantially reduce the probability of being employed, the hourly wages and the number of days worked, while they raise working hours per day worked. We argue that the results are causal in nature and they are robust to different specifications and variables' definitions and a wide range of controls.

These effects are almost entirely accounted for by the checkpoints, while the other barriers have more limited impact. Moreover, most of the effects appear not to be driven by the negative impact of the physical barriers on restricting workers' mobility. Therefore we hypothesize that the bulk of the closures' effect on the labor market would be driven by the other main channel we identified, i.e. reduced firms' profitability and labor demand. However further research using firm level data would be needed to explicitly test for this hypothesis.

The analysis is likely to provide an underestimation of the actual labor market effects of the barriers as it cannot capture the general equilibrium effects nor the dynamic effects (e.g. through lower human capital accumulation) of mobility restrictions. Notwithstanding these limitations, our estimates suggest that the checkpoints have non negligible effects on the West Bank labor market. In our preferred estimation, placing one check-point one minute away from a locality decreases the probability of being employed by 0.41 percentage points, the hourly wage by 6.3 percentage points and the working days by 2.6 percentage points, while it increases the hours per working day by 4.3 percentage points. Taking the year 2007 as an example, we estimate that these effects translate into costs of around USD 229 million or 6% of West Bank GDP. Most of these costs are due to lower wages, suggesting that the labor markets have adjusted to the restrictions more through prices than through quantities.

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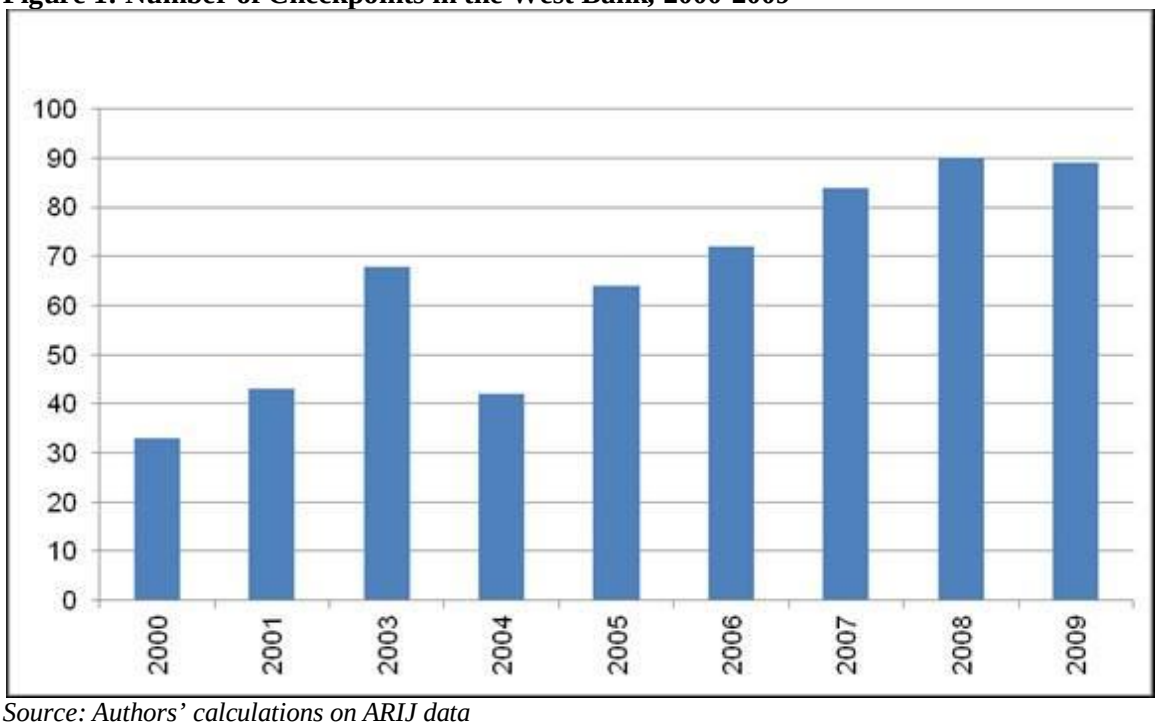
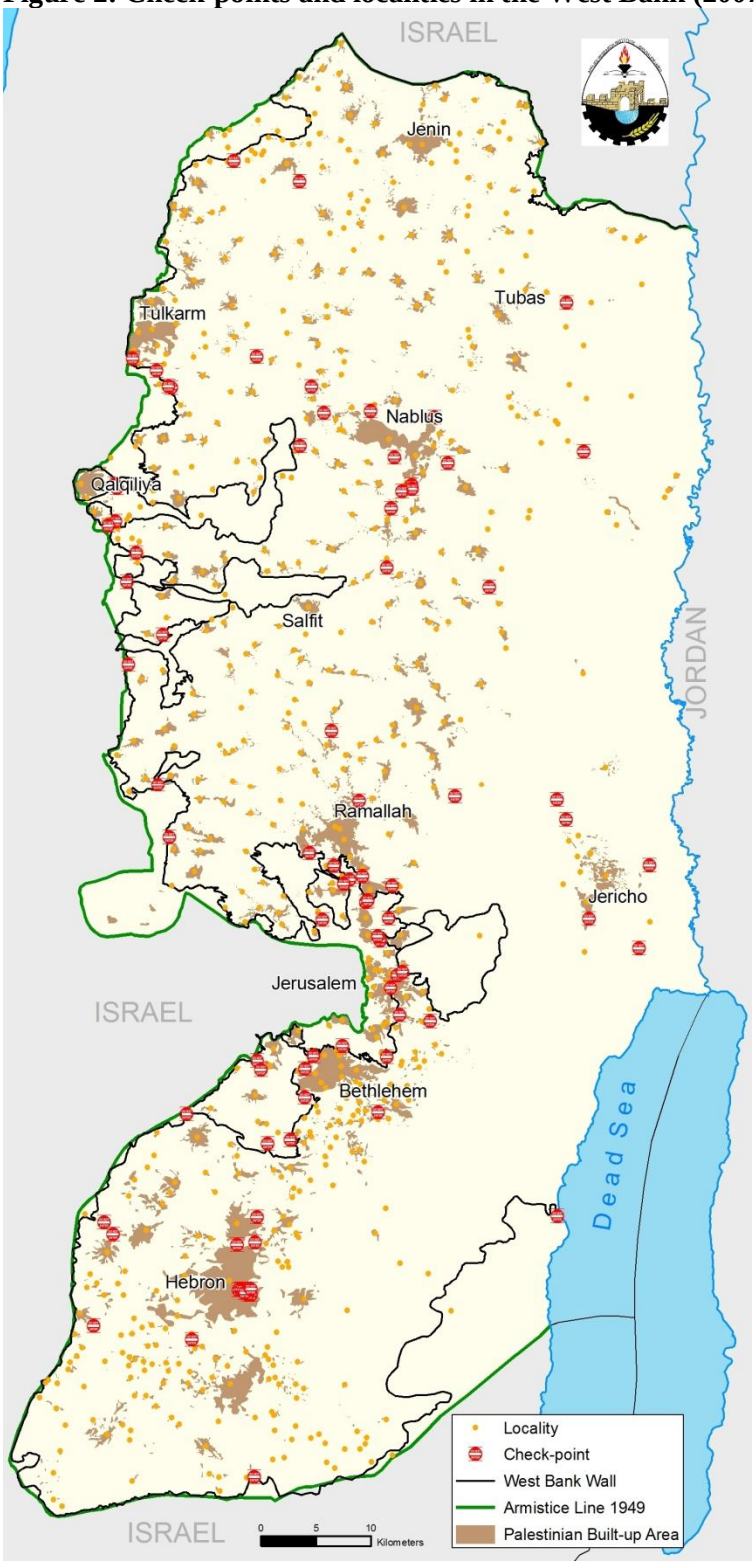
Figures and tables

Figure 1: Number of Checkpoints in the West Bank, 2000-2009



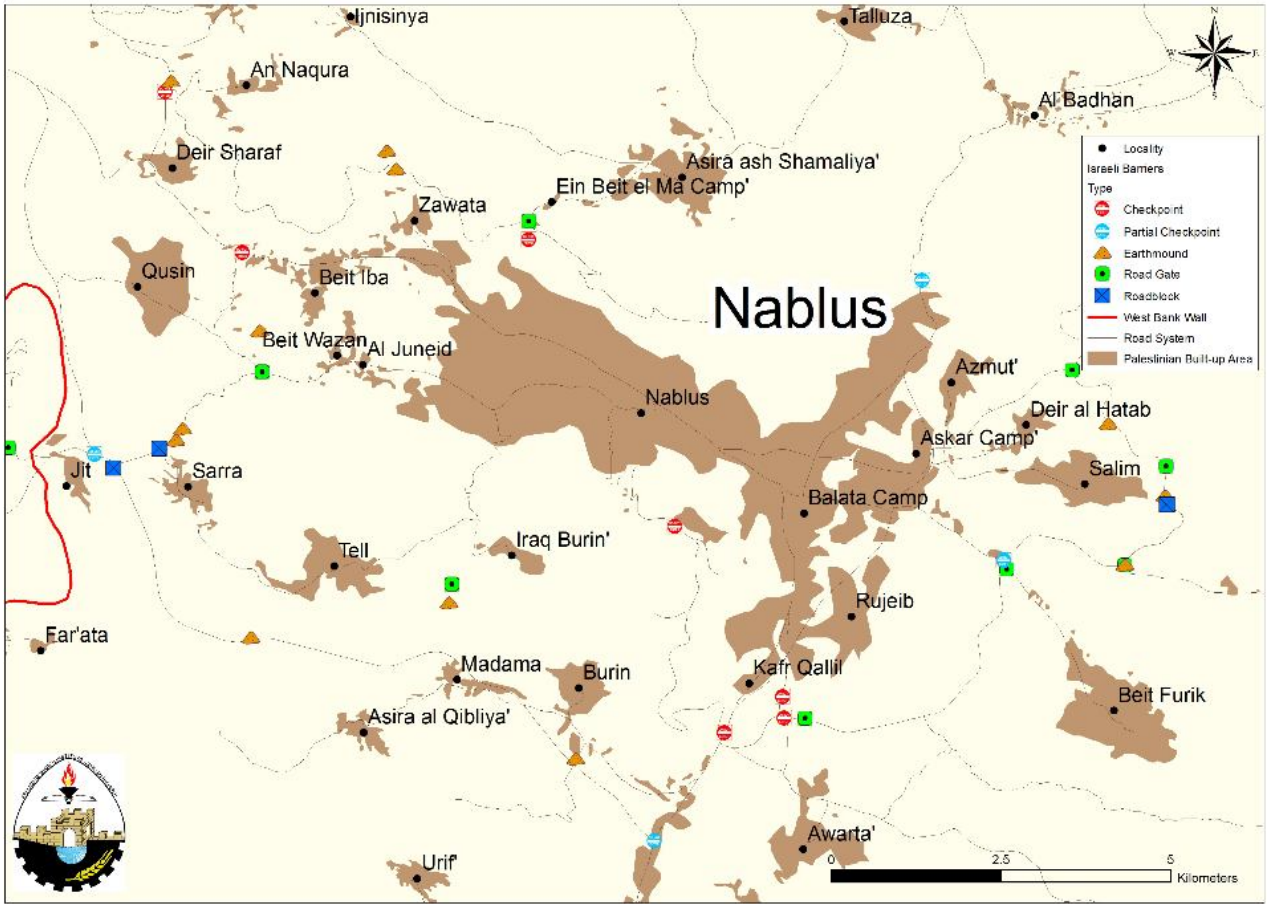
Source: Authors' calculations on ARIJ data

Figure 2: Check-points and localities in the West Bank (2007)



Source: ARIJ

Figure 3: Check-points and other barriers in the Nablus areas (2007)



Source: ARIJ

Table 1: Summary Statistics for key Variables

		Obs.	Mean	SD
Employment Rate		228,423	0.73	0.44
Hourly Wage		85,591	10.71	11.00
Work Days Per Month		96,056	21.62	6.40
Work Hours Per Day		92,899	8.78	6.57
Male		450,488	0.51	0.50
Schooling		450,381	9.79	3.96
Age		450,488	32.20	12.48
Married		450,488	0.58	0.49
Locality type	City	450,488	0.48	0.50
	Refugee camp	450,488	0.08	0.27
	Village	450,488	0.44	0.50
Tenure (Months)		96,326	80.86	85.13
Place of Work	In Same District in WB	191,770	0.79	0.41
	In other District in WB	191,770	0.07	0.25
	Israel	191,770	0.12	0.33
	Settlements	191,770	0.02	0.14
Manufacturing		209,899	0.14	0.34
Working Out of Locality		143,568	0.50	0.50
Working Out of District		209,899	0.20	0.40

Source: Authors' elaboration on Palestinian Labor Force Surveys

Table 2: Testing for reverse causality

	(1) ΔPB^{30min}	(2) ΔPB^{30min}	(3) ΔPB^{30min}	(4) ΔPB^{30min}	(5) ΔCP^{30min}	(6) ΔREG^{30min}
$\Delta emp_{(t-1)}$	-0.2157			-0.1328	0.0487	-0.1816
	(0.237)			(0.275)	(0.073)	(0.255)
$\Delta wage_{(t-1)}$		0.0036		0.0034	0.0001	0.0033
		(0.003)		(0.003)	(0.001)	(0.003)
$\Delta hours_{(t-1)}$			-0.0054	-0.0039	-0.0003	-0.0036
			(0.005)	(0.006)	(0.002)	(0.006)
$\Delta fat_{(t-1)}$	0.0034	0.0026	0.0017	0.0027	0.0134	-0.0107
	(0.034)	(0.034)	(0.034)	(0.035)	(0.009)	(0.032)
Locality effects	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES
Observations	1,347	1,327	1,347	1,327	1,327	1,327
R-squared	0.499	0.497	0.499	0.498	0.474	0.446
Nr. of localities	282	282	282	282	282	282

*Robust standard errors (Huber-White method) in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. The regressors are measured as changes in the variables between the third and the fourth quarter of the preceding year (see main text for more details).*

Table 3: The effect of closures on labor market variables

	(1) Emp	(2) Emp	(3) Wage	(4) Wage	(5) W_days	(6) W_days	(7) W_hours	(8) W_hours
PB^{30min}	-0.0008***		-0.0036		-0.0029		0.0033	
	(0.000)		(0.003)		(0.002)		(0.002)	
CP^{30min}		-0.0045***		-0.0521***		-0.0192**		0.0346***
		(0.001)		(0.013)		(0.008)		(0.010)
REG^{30min}		-0.0004*		0.0017		-0.0011		-0.0002
		(0.000)		(0.003)		(0.002)		(0.003)
Basic contr.	YES	YES	YES	YES	YES	YES	YES	YES
Ind. eff.	YES	YES	YES	YES	YES	YES	YES	YES
Time eff.	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	96,318	96,318	85,532	85,532	93,865	93,865	88,845	88,845
R-sq. within	0.082	0.082	0.027	0.028	0.015	0.015	0.008	0.008
Nr. workers	45,584	45,584	42,652	42,652	44,560	44,560	43,838	43,838

*Robust standard errors (Huber-White method) clustered at individual level in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. Basic controls include years of schooling, age, age squared, marital status, tenure, urban area / refugee camp residence dummies, a set of work place dummies and Hebron district-time interaction.*

Table 4: The effect of closures on labor market variables, robustness for barriers

	(1) Emp	(2) Emp	(3) Wage	(4) Wage	(5) W_days	(6) W_days	(7) W_hours	(8) W_hours
PB^{30Km}	-0.0004**		-0.0030		-0.0027**		0.0027	
	(0.000)		(0.002)		(0.001)		(0.002)	
CP^{30Km}		-0.0028***		-0.0517***		-0.0208***		0.0328***
		(0.001)		(0.010)		(0.006)		(0.008)
REG^{30Km}		-0.0001		0.0010		-0.0012		0.0001
		(0.000)		(0.002)		(0.001)		(0.002)
Obs.	96,318	96,318	85,532	85,532	93,865	93,865	88,845	88,845
R-sq. within	0.082	0.082	0.027	0.028	0.015	0.016	0.008	0.008
Nr. workers	45,584	45,584	42,652	42,652	44,560	44,560	43,838	43,838

*Robust standard errors (Huber-White method) clustered at individual level in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. All regressions include individual fixed effects, time effects and a set of controls including years of schooling, age, age squared, marital status, tenure, urban area / refugee camp residence dummies, a set of work place dummies and Hebron district-time effects.*

Table 5: The effect of closures on labor market variables, further controls

	(1) Emp	(2) Emp	(3) Wage	(4) Wage	(5) W_days	(6) W_days	(7) W_hours	(8) W_hours
CP^{30min}	-0.0043***	-0.0041***	-0.0598***	-0.0635***	-0.0217**	-0.0256***	0.0394***	0.0426***
	(0.001)	(0.001)	(0.014)	(0.014)	(0.009)	(0.009)	(0.011)	(0.011)
REG^{30min}	-0.0003	-0.0002	0.0009	0.0003	-0.0028	-0.0030	0.0004	0.0006
	(0.000)	(0.000)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
$Fatalities_{(q-1)}$	-0.0006***	-0.0005***	0.0017	0.0015	0.0012	0.0011	-0.0015	-0.0014
	(0.000)	(0.000)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Wall (km)	0.0001**	0.0001**	0.0023	0.0025	-0.0012	-0.0008	-0.0033	-0.0036
	(0.000)	(0.000)	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)
Emp $Israel_{(q-1)}$	-0.0002***	-0.0002***	0.0006**	0.0005**	0.0003**	0.0003*	-0.0005**	-0.0004*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sect-time eff.	NO	YES	NO	YES	NO	YES	NO	YES
Obs.	92,335	92,335	82,005	82,005	89,952	89,952	85,118	85,118
R-sq. within	0.080	0.109	0.028	0.034	0.015	0.021	0.008	0.011
Nr. Workers	44,172	44,172	41,278	41,278	43,152	43,152	42,414	42,414

*Robust standard errors (Huber-White method) clustered at individual level in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. All regressions include individual fixed effects, time effects and a set of controls including years of schooling, age, age squared, marital status, tenure, urban area / refugee camp residence dummies, a set of work place dummies and Hebron district-time effects.*

Table 6: Disentangling the effects of closures on the labor market by place of work

	(1) Emp	(2) Emp	(3) Wage	(4) W_days	(5) W_hours
CP^{30min}	-0.0031***	-0.0030***	-0.0623***	-0.0267***	0.0476***
	(0.001)	(0.001)	(0.014)	(0.009)	(0.011)
REG^{30min}	-0.0011***	-0.0012***	-0.0008	-0.0037*	0.0004
	(0.000)	(0.000)	(0.004)	(0.002)	(0.003)
Workplace out of district x CP^{30min}	-0.0025*		-0.0033	0.0037	-0.0146*
	(0.001)		(0.011)	(0.007)	(0.008)
Workplace out of district x REG^{30min}	0.0039***		0.0047	0.0031	0.0009
	(0.001)		(0.004)	(0.002)	(0.003)
Workplace out of dist. in WB x CP^{30min}		-0.0004			
		(0.001)			
Workplace out of dist. in WB x REG^{30min}		-0.0003			
		(0.000)			
Workplace out of dist. Israel x CP^{30min}		-0.0035*			
		(0.002)			
Workplace out of dist. Israel x REG^{30min}		0.0069***			
		(0.001)			
Observations	92,335	92,335	82,005	89,952	85,118
R-sq. within	0.113	0.117	0.034	0.022	0.011
Nr. of workers	44,172	44,172	41,278	43,152	42,414

*Robust standard errors (Huber-White method) clustered at individual level in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. All regressions include individual fixed effects, time effects, sector-round dummies and a set of controls including years of schooling, age, age squared, marital status, tenure, urban area / refugee camp residence dummies, a set of work place dummies, Hebron district-time effects, locality's number of fatalities in the preceding quarter, locality's length of the West Bank wall, the locality's share of workers employed in Israel the year before and sector-year effects.*

Table 7: Disentangling the effects of closures on the labor market by workers' answers

	(1) Emp	(2) Wage	(3) W_days	(4) W_days	(5) W_days	(6) W_hours	(7) W_hours	(8) W_hours
CP^{30min}	-0.0038***	-0.0645***	-0.0253***	-0.0275***	-0.0253***	0.0438***	0.0392***	0.0435***
	(0.001)	(0.014)	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.011)
REG^{30min}	-0.0002	0.0003	-0.0030	-0.0029	-0.0026	0.0006	0.0008	0.0004
	(0.000)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Absent due to closure (%)	-0.0019**	0.0110***	-0.0028*			-0.0123***		
	(0.001)	(0.004)	(0.002)			(0.003)		
Less than 35 hrs due to closure (%)				-0.0069***			-0.0124***	
				(0.001)			(0.002)	
Absent due to closure					-0.0635***			
					(0.023)			
Less than 35 hrs due to closure								-0.4137***
								(0.027)
Observations	92,335	82,005	89,952	89,952	89,729	85,118	85,118	81,981
R-sq. within	0.110	0.034	0.021	0.022	0.022	0.011	0.012	0.024
Nr. of workers	44,172	41,278	43,152	43,152	43,067	42,414	42,414	41,723

*Robust standard errors (Huber-White method) clustered at individual level in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. All regressions include individual fixed effects, time effects, sector-time effects and a set of controls including years of schooling, age, age squared, marital status, tenure, urban area / refugee camp residence dummies, a set of work place dummies, Hebron district-time effects, locality's number of fatalities in the preceding quarter, locality's length of the West Bank wall, the locality's share of workers employed in Israel the year before and sector-year effects.*

Table 8: The effects of barriers on the labor market by type of locality

	(1) Emp	(2) Wage	(3) W_days	(4) W_hours	(5) Emp	(6) Wage	(7) W_days	(8) W_hours
CP^{30min}	-0.0041***	-0.0719***	-0.0314***	0.0476***	-0.0030***	-0.0634***	-0.0322***	0.0394***
	(0.001)	(0.014)	(0.009)	(0.011)	(0.001)	(0.016)	(0.010)	(0.013)
REG^{30min}	-0.0004	0.0037	0.0027	-0.0023	0.0001	0.0020	-0.0025	0.0006
	(0.000)	(0.004)	(0.002)	(0.003)	(0.000)	(0.004)	(0.002)	(0.003)
CP x net labor import	0.0000**	0.0003**	0.0001**	-0.0000				
	(0.000)	(0.000)	(0.000)	(0.000)				
REG x net labor import	-0.0000***	-0.0001	-0.0000	0.0000				
	(0.000)	(0.000)	(0.000)	(0.000)				
CP x tot empl.					-0.0000*	0.0000	0.0000**	0.0000
					(0.000)	(0.000)	(0.000)	(0.000)
RBO x tot empl.					-0.0000*	-0.0000	-0.0000	-0.0000
					(0.000)	(0.000)	(0.000)	(0.000)
Observations	78,215	69,361	76,330	72,221	90,888	80,637	88,525	83,724
R-sq. within	0.111	0.034	0.023	0.012	0.110	0.034	0.022	0.011
Nr. workers	37,696	35,158	36,888	36,228	43,518	40,641	42,507	41,771

*Robust standard errors (Huber-White method) clustered at individual level in parentheses; *significant at 10%; **significant at 5%; ***significant at 1%. All regressions include individual fixed effects, time effects, sector-time effects and a set of controls including years of schooling, age, age squared, marital status, tenure, urban area / refugee camp residence dummies, a set of work place dummies, Hebron district-time effects, locality's number of fatalities in the preceding quarter, locality's length of the West Bank wall, the locality's share of workers employed in Israel the year before and sector-year effects.*