

Business Lifecycle under Conflict-Related Mobility Restrictions in Palestine: Evidence from Establishment Censuses

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I. Motivation

The Israeli occupation of Palestine has been accompanied by repressive security and economic policies affecting inter-regional and cross-border mobility of people, materials and capital. Israel, Palestine's closest neighbor, rich trade partner and home to many capital-intensive and technology firms, has held keys to Palestinians' access to materials and funds, and opportunities for trade and high-quality employment. The restrictions on domestic activity and on exchange with Israel combine to impose stiff constraints on how Palestinian civilians, business establishments and public institutions can conduct their day-to-day responsibilities, and inflict grave harm on their prospects of attaining prosperity.

This study explores economic implications of the Israeli-imposed mobility restrictions for business establishments across all occupied Palestinian territories. We evaluate the conditions for opening, operating and expanding of businesses over the years, particularly between regions affected most versus least by the trade and travel restrictions imposed under the Israeli occupation. Firms' operating and legal status, economic activity, employment and female employment are assessed.

The study relies on two sources of highly specialized, complementary data: Firms' operations are taken from four waves of the Palestinian Establishment Census surveying all Palestinian business establishments in years when the Israeli occupation regime was at the least restrictive level (1997), at the height of restrictiveness (2004 and 2007), and in years when the security

situation stabilized (2012). These surveys add up to 520,000 establishment-year observations, and allow linking of firms' status across several years in a panel setup. Information on the restrictiveness of the Israeli occupation regime for businesses and civilians in various years was painstakingly collected from the United Nations Office for the Coordination of Humanitarian Affairs – occupied Palestinian territories (OCHA oPt), B'Tselem, internal World Bank databases, and other sources. Principal component analysis is used to construct a one-dimensional index of restrictiveness of the security regime across governorates and years, in order to explain firms' lifecycle status. Utilizing the various specialized data sources in tandem in a difference-in-difference framework is an important contribution of this study.

The study is organized as follows. Section II outlines the background of the Israeli occupation of Palestine since the Oslo II Accord of 1995. The section also presents existing evidence of the burden of the Israeli occupation on Palestinian firms. Section III outlines the estimation methods and testable hypotheses regarding the impact of mobility restrictions on firms' status. Section IV describes the data used to evaluate the hypotheses. Finally, section V presents results and concludes with major findings and their significance for international policymaking.

II. Historical review of conflict-related restrictions in Palestine

The time period evaluated in our analysis of firms' lifecycle status, 1997–2012, spans fifteen tumultuous years from the signing of the Oslo II Accord in 1995 through the outbreak of the Second Intifada in 2000, beginning of the construction of a separation barrier in West Bank and East Jerusalem in 2002, the Disengagement Plan in August 2005 leading to Israel's withdrawal from Gaza, continued expansion of Israeli settlements and restricted-access areas in West Bank following the Second Intifada, the Israeli blockade and military offensives in Gaza during 2007–2008, and clashes of the Israeli and Hamas forces in Gaza in 2008–2009 and 2012.

In September 2000, the Second Intifada erupted in full and raged for the following five years. Many welfare and business-climate indicators deteriorated or stagnated in the first two years of the Second Intifada, amidst the Israeli blockade and military offensives in Gaza, and amidst the proliferation of Israeli settlements and restricted-access areas in West Bank. Construction materials and building permits became hard to come by, and the provision of public services and infrastructure, such as roads, hospitals and sanitation deteriorated (Bocco et al. 2002). As part of the security measures enacted following the start of the Second Intifada, Israel implemented a system of roadblocks, checkpoints and other obstructions to restrict mobility within West Bank as

well as across its borders. Violent confrontations peaked in summer 2002, but economic deprivation of Gaza and West Bank became particularly pronounced in the ensuing years after Israel started constructing a separation barrier inside West Bank and East Jerusalem in 2002. Road infrastructure became increasingly fragmented and failed to properly connect individual regions. Construction continued within Israeli settlements, contributing to the fragmentation of Palestine into unconnected markets. The fragmentation of West Bank into disparate communities separated by military zones, settlements and physical road obstacles limited and complicated firms' access to their markets, suppliers and workers (World Bank 2014). In Gaza, the strict closure which restricted movement of people and goods in and out of its territory led to particularly adverse living and business conditions there.

The Second Intifada ended and trade restrictions were partially lifted in summer 2005, but the relaxation was weak and short-lived. Following Hamas's victory in Palestinian Authority's legislative elections in January 2006, economic sanctions by Israel and the Quartet on the Middle East (UN, EU, Russia and US) tightened. Israel imposed a blockade over Gaza and implemented punitive measures including cuts to fuel and electricity supplies (B'Tselem 2014). Within West Bank, restrictions on movement and trade persisted (World Bank 2007). The number of road checkpoints kept rising gradually, to 80 by July 2007 and 96 by November 2015 (B'Tselem 2015). Business perception surveys mentioned political instability and the corresponding macroeconomic instability, corruption, interrupted access to electricity, and transportation restrictions as major constraints impinging on firms' operations (World Bank Enterprise Survey 2006-2007, as cited in World Bank 2013). In 2008 hostilities between Hamas and Israel in Gaza intensified again, leading up to the January 2009 Gaza War (a.k.a., Israeli Operation Cast Lead). Humanitarian situation in Gaza deteriorated further, leading to "a massive destruction of livelihoods and a significant deterioration of infrastructure and basic services" for Palestinians (Mansour 2009).

A period of reconstruction followed, fueled in part by a relaxation in the mobility restrictions in 2009 (van der Weide et al. 2015). Year 2011 was the most politically stable year when the economy regained some of the past losses. Economic growth slowed down in 2012 and 2013, with isolated incidents of violence in March and November 2012, which was reflected in Palestinians' rating of economic conditions. In years 2013 and 2014, the security situation deteriorated yet again. The closure of Rafah, the only crossing between Gaza and Egypt, limited the ability of civilians and businesses to access markets and social and health services on the other side of the border. Another destructive war in Gaza then erupted in July 2014. To this day, because of poor state of

infrastructure and multitude of restrictions on their day-to-day operations, Palestinian firms have difficulties doing business domestically, cannot compete in the export market and have a low prospect for expanding, or even survival (ITC 2015; van der Weide et al. 2015). This continues to drag down the statewide economy, keeping Palestine in a perpetual deprivation trap in need of donor aid (World Bank 2013).¹

International trade and macroeconomic conditions in Palestine

Palestinian industry and trade have traditionally been oriented strongly toward Israel. In 2014, Israel made up 69.6 percent of Palestinian imports and 83.9 percent of exports. Egypt is only Palestine's 9th largest trade partner by volume, with nearly all trade consisting of imports to Gaza. Trade flows between Gaza and West Bank remain negligible. Exports from Gaza are undermined by the Israeli blockade of Gaza, including the obstruction of exports to West Bank. This has led to the decline of Gaza's exports to around 3 percent of their 2005 levels (Judis 2014).

Security protocols and restrictions on mobility within Palestine and across borders – including closures of roads and border crossings – have eroded Palestinian capacity to export (ESCWA 2015; ITC 2015). Palestinian firms compete with unconstrained foreign firms and are at a cost disadvantage. All goods entering or exiting Palestine via Israel are required to use Israeli transport firms, and are subject to similar screening procedures as at internal checkpoints. Under a *back-to-back* security system, trucks in Palestine are restricted from entering urban areas, so all goods must be reloaded from trucks at special border facilities onto other trucks waiting on the other side. This causes direct increases in costs as well as delays, spoilage and damage to goods (Akkaya et al. 2008). With the shrinking share of agricultural and manufacturing sectors to GDP, Palestinian exports of goods and services together accounted for only 20 percent of GDP in 2014, a small share compared to other small open economies.

Conditions differ dramatically between Gaza and West Bank. Beside the system of checkpoints and closures across Palestine, Gaza Strip has been under full blockade since 2007, which has inhibited its ability to engage in trade and virtually eliminated exports. As the Palestinian economy recovered from the devastation of 2000–2002, exports from West Bank increased continuously

¹ Beside the burden of security protocols and mobility restrictions implemented by the Israeli forces, Palestinian firms suffer under incompetent and haphazard governance by local regulatory authorities. Two-thirds of businesses perceive that regulations are not interpreted consistently and predictably (Investment Climate Survey). Corruption of public officials is a problem. Draft form of competition law has been awaiting implementation for several years, leading to regulatory vacuum and uncertainty in the meantime.

starting in 2003, yet exports from Gaza stalled, and fell to near zero by 2010 after the imposition of a blockade of Gaza. Agricultural products, which could rot if held up at checkpoints, are now sold much closer to their place of origin. This has given rise to internal price differentials across Palestine, for example differentials of 50 percent between Nablus and Ramallah, two cities 40 kilometers apart but separated by numerous checkpoints.

Macroeconomic performance of Gaza was worse than West Bank's for all years 1994–2014. From 1994 to 1999, both economies moved on a positive growth trajectory. Real GDP per capita in West Bank and Gaza rose from \$1,494 and \$1,347 in 1994, to \$1,948 and \$1,372 in 1999, respectively. In 1998, real GDP per capita in West Bank and Gaza exhibited high growth rates of 11.5 and 8.9 percent, respectively. However, from 2000 to 2003, the start of the intifada led to a sharp contraction in economic growth in West Bank as well as in Gaza.

Disparity between West Bank and Gaza grew in years following 2005 – a turning point that saw complete Israeli disengagement from Gaza including military withdrawal and settlement dismantlement. At the same time as the withdrawal offered Palestinians greater mobility within Gaza, Israel imposed a stricter regime for the movement in and out of Gaza for 1.7 million Gazans, including 1.3 million refugees recognized by the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA). In 2006 Israel launched a military operation and tightened its blockade of Gaza. Rafah Crossing, previously facilitating movement to and from Egypt, closed seven months after the disengagement. All these factors, and most notably the blockade of Gaza caused a contraction of the Palestinian economy and distortion of daily operations for Gaza residents and businesses.

The triumph of Hamas in the Palestinian legislative elections of 2006 pushed Israel to intensify its restrictions on trade, and capital and labor mobility in Palestine, and to withhold cargo-clearance revenues. These restrictions slowed down investment and increased net exports gap, leading to a reduction of the Palestinian real GDP by 3.9 percent and per capita GDP by 6.8 percent in 2006. GDP in Gaza contracted by 17.5 percent in 2006, while GDP in West Bank expanded by 4.2 percent. IMF has estimated that investment fell by over 15 percent, “resulting in a hollowing out of the productive sectors” and ceasing of public investment (cited in World Bank 2008:3). In spite of the crisis in Gaza and fall in the Palestinian investment and net exports, consumption in Palestine at large dropped by a mere 3 percent in 2006 owing to a combination of recovery in West Bank, and flows of aid, remittances and borrowing from abroad.

In June 2007, Israel declared Gaza a hostile entity, and imposed a blockade on it. In part due to the blockade and a 22-day Israeli military operation in December 2008–January 2009, Gaza’s GDP contracted by 6.5 percent in 2007 and 8.6 percent in 2008. Exports of goods were nearly eliminated in 2008.

At the same time, the situation in West Bank was improving. Israel removed financial sanctions on West Bank in June 2007 (IMF 2013). This led to a rebound in economic activity in West Bank and growth reached 12.8 percent in 2007 and 11.8 percent in 2008. Thus, the 2007 and 2008 growth rates of 6.6 and 6.1 percent for Palestine at large came from positive growth in West Bank.

In December 2007 the Paris Donors Conference led to a pledge of \$7.4 billion in aid to Palestine. The impact was evident in the following year. Growth was driven by a large flow of aid, followed by the lowering of restrictions by Israel. In 2009, GDP in West Bank and Gaza grew by 9.1 and 7.4 percent, respectively. Growth in Gaza was largely due to a rebound from low growth levels of 2006–2008 and the expansion of tunnel trade from Egypt. Although the war and the imposed blockade hampered reconstruction efforts in Gaza, the economy rebounded largely due to the proliferation of informal “tunnel economy” trade.

Economic recovery continued in 2010 with household consumption in Palestine growing by nearly 3.8 percent, net exports by 9.7 percent and GDP by an estimated 8.1 percent. Gaza saw growth of 11.4 and 17.7 percent in 2010 and 2011, showing recovery from very low levels following the tightening of Israeli blockade in 2006. Most of the growth in Gaza can be attributed to increased cross-border tunnel trade with Egypt, leading to growth in the construction sector of 192.2 percent in 2010 and 132.4 percent in 2011. Gaza’s deprivation under the 2006–2009 Israeli blockade and the 2008–2009 winter Gaza War also played a significant role in the following recovery. In West Bank, mobility restrictions were marginally reduced, and West Bank continued seeing positive growth.

In 2013 the economies of Gaza and West Bank slowed down. Palestinian GDP rose by 6.3 percent in 2012, but only by 2.2 percent in 2013. The slowdown resulted from the continuation of restrictions imposed by Israel, decline of agricultural production, elevated imports without corresponding increases in exports or output (World Bank 2013). Moreover, private investment and production in Palestine declined during 2013. Until July 2013 tunnel economy was alleviating the impact of the blockade imposed on Gaza in 2007. Over 150 tunnels operated, bringing in mainly construction materials at much lower cost than those brought from Israel. When Egyptian security forces began demolishing known trade routes, construction activities in Palestine

contracted by 28.3 percent between the second and third quarter of 2013, and by 63.9 percent year-on-year in the first quarter of 2014 (B'Tselem 2014).

July–August 2014 saw the eruption of another war in Gaza. This war led to the largest destruction of infrastructure and property and the largest loss of life since the onset of the Israeli occupation. The military conflict and the halt of tunnel economy cost Gaza's economy some \$460 million in lost output and infrastructure damages worth \$400 million (World Bank 2015). At the same time, West Bank's GDP rose in 2014 by 5.1 percent on bank-loan fueled growth in private consumption and exports. In the first two quarters of 2015, Israeli blockade of Gaza remained largely in place, and reconstruction efforts produced only slow economic recovery (IMF 2015a). During the first quarter of that year, Gaza's GDP rose by 6.7 percent owing to reconstruction efforts, while West Bank's contracted by 2.9 percent owing to a four-month suspension of transfers of cargo-clearance revenues (IMF 2015b).

III. Methods

This study aims to quantify the effect of mobility restrictions imposed by Israeli forces in the occupied Palestinian territories on the organization of the Palestinian economy and the lifecycle of Palestinian establishments. Several methodologies are used for this task. First, two alternative indicators are used to quantify the degree of restrictiveness of the security regime in each Palestinian governorate at the time leading up to the four Establishment Censuses. One of these indicators relies on principal component analysis (PCA) of vectors of mobility constraints. For the second methodology, a difference-in-difference estimator at the level of Palestinian governorates is deployed to isolate the effect of the security regime on firms' status and performance.

Identification strategy 1: quantifying mobility restrictions

To distinguish areas affected more versus less heavily by the Israeli-imposed mobility restrictions, two indicators of the burden borne by establishments in individual governorates are utilized: 1) the density of fixed road checkpoints, and 2) an economic restriction index constructed by PCA of source vectors of Israeli security measures. To our knowledge, this is the first time PCA is used to gauge the degree of restrictiveness of a regime of civilians' mobility across regions, although political science literature has previously considered PCA to measure regulation, or governance quality (Jalilian et al. 2007, Langbein and Knack 2010).

As our first approach, the density of fixed road checkpoints in each governorate in the West Bank as of November 2015 is used to classify governorates according to the constraints faced by businesses and workers near the end of the Intifada and in the decade since then. One justification is that the majority of these fixed checkpoints were erected between 2000 and 2005 and have remained in place since then. Another justification for using this static delineation is empirical: The count of mobility restrictions is not available consistently for all years.

This time-constant indicator classifies governorates as most affected (+1: Hebron, Tulkarm, Qalqiliya, East Jerusalem), medium affected (0: Ramallah and Al-Bireh, Nablus, Bethlehem) or least affected (-1: Jenin, Jericho and Al Aghwar, Salbit, Tubas). The three groups of governorates were chosen in view of natural breaks in the data – 0 to 1, 1 to 1.5, and 2.8 to 3.5 checkpoints per 100km² – and because each group represents approximately one third of the Palestinian territory. Table 1 shows the number of fixed checkpoints and their geographic density as of November 2015, with governorates sorted in ascending order by checkpoint density. Using only internal checkpoints rather than all checkpoints, one would get a nearly identical grouping of governorates.

Another measure of the restrictiveness of the security measures under the Israeli occupation is a summary index of hardships experienced by Palestinian businesses and workers in each year, as documented by governmental and non-governmental organizations. This summary index is obtained using principal component analysis of the source vectors of mobility restrictions. In particular, the following vectors of security measures were incorporated: house demolitions; adults and minors made homeless; curfew hours and curfew incidents; full-time, part-time, and flying checkpoints; searches and arrests; adult and child fatalities and injuries; population exposed to violence; Israeli and Yesha Council settlements; and settler density. These factors are thought to be predictive of Palestinians' ability to open, run and expend businesses, because they reflect the red-tape, transportation and transaction costs, and risks of doing business and working in each region. There is sufficient variation in these vectors over time, suggesting that this index could provide a better measure of the security regime faced by firms than the static measure in table 1.

The PCA is conducted cross-sectionally in each year, and scores from the retained first principal component are used as the values of the mobility-restriction index in that year.² For ease

² A more advanced method, dynamic PCA (DPCA) is considered for a follow up robustness analysis. Refer to appendix 2. Nevertheless, the small sample of governorate×year observations calls into question whether one can rely on this advanced data-intensive method.

of interpretation, and comparability across years, governorates are again classified according to the estimated scores as most (+1), medium (0) or least (-1) affected by Israeli security measures.

The indicators of the intensity of security restrictions give rise to three testable hypotheses:

H1: Establishments operating under tighter mobility restrictions in their governorate in recent years achieve inferior operating status and performance than establishments operating under looser restrictions.

H2a: Establishments operating under tighter mobility restrictions put themselves out of harm's way by relocating to governorates facing looser restrictions.

H2b: Establishments operating under tighter mobility restrictions put themselves out of harm's way by temporarily closing, and reopening in years under looser restrictions.

Table 1. Fixed checkpoints by West Bank governorate, November 2015 (count)

Governorate	Area (km ²)	Internal checkpoints	Last checkpoint before Israel	Other border checkpoints	Total fixed checkpoints	Density of fixed checkpoints./100km ²
Tubas	402	1	0	0	1	0.2
Jericho & Al Aghwar	593	3	1	1	5	0.8
Salfit	204	2	0	0	2	1.0
Jenin	583	1	5	0	6	1.0
Ramallah & Al-Bireh	855	6	5	0	11	1.3
Nablus	605	9	0	0	9	1.5
Bethlehem	659	5	5	0	10	1.5
Hebron	997	7	4	17 ^a	28	2.8
Tulkarem	246	1	6	0	7	2.8
Qalqiliya	166	2	3	0	5	3.0
East Jerusalem	345	2	10	0	12	3.5
Total	5,655	39	39	18	96	1.7

Source: Author's analysis of B'Tselem data. Governorates ordered by density of fixed checkpoints.

^a Border checkpoints near Israeli settlement enclaves.

2 additional border crossing checkpoints exist between the Gaza Strip and Israel: Erez pedestrian crossing and Kerem Shalom crossing for transporting of goods & fuel. Temporary flying checkpoints are also prevalent in Palestine, but their numbers have not been kept track of week by week or even, averaged, annually.

Table 2. Flying checkpoints, and full-time and part-time checkpoints by governorate in West Bank, selected years 2005–2012 (count)

	Flying checkpoints				Full-time & part-time checkpoints								
	2005	2006	2007	2008	Jan-04	Jan-05	Jan-06	Jan-07	Jan-08	Jan-09	Jan-10	Jan-11	Jan-12
Jenin	54	878	1,068	328	2	1	2	2	2	3	3	3	3
Tubas	109	286	108	143	1	1	2	1	1	1	1	1	1
Tulkarem	389	365	430	252	2	3	2	3	4	5	5	5	5
Nablus	220	653	259	171	7	7	7	8	8	8	8	10	10
Qalqiliya	371	1,375	1,593	637	--	--	2	2	6	7	9	7	6
Salfit	76	336	280	256	2	2	2	2	2	2	3	3	3
Ramallah & Al Bir	83	269	97	56	6	6	6	6	6	6	8	12	12
Jericho, Anha, Al Aghwar	34	35	59	11	1	2	3	3	3	4	4	3	3
Bethlehem	283	1,180	737	404	8	7	10	11	11	11	12	10	8
Hebron / Al Khalil	564	1,485	894	759	31	32	35	36	37	37	41	39	39
Jerusalem / Al Quds	82	228	333	61	--	--	--	--	--	--	--	1	1
East Jerusalem (J1, when excluded from Jerusalem stats)					--	1	1	1	1	2	2	2	2
J2 (when excluded from Al Quds & J1)					4	3	8	10	10	13	15	12	12
Total	2,265	7,090	5,858	3,078	64	65	80	85	91	99	111	108	105

Source: Flying checkpoints from OCHA oPt; full-time and part-time checkpoints from Roy van der Weide, World Bank. '--' unavailable. 'Total' treats unavailable as 0.

Table 3. Principal component analysis scores, and governorates facing the least vs. most restrictions (L/M)

Governorate	2002-04 ^a	2005-06 ^b	2009-10 ^c	2013-14 ^d
Tubas	0.084 L	0.369	0.000 L	0.016 L
Jericho & Al Aghwar	0.295	0.083 L	0.438	0.000 L
Jenin	0.021 L	0.485	0.359 L	0.196 L
Hebron & Al Khalil	0.040 L	0.339 L	0.619 M	0.402
Tulkarem	0.000 L	1.000 M	0.401 L	0.160 L
Nablus	0.084	0.727 M	0.515	0.331
Bethlehem	0.276	0.521	0.568	0.558 M
Ramallah & Al-Bireh	0.363	0.428	1.000 M	0.633 M
Salfit	0.845 M	0.609 M	0.583	0.517
Qalqiliya	0.551 M	0.896 M	0.658 M	0.523
East Jerusalem	1.000 M	0.000 L	0.760 M	1.000 M
Average	0.324	0.496	0.536	0.394

Source: Author's analysis of B'Tselem, OCHA oPt, PCBS and Roy van der Weide (World Bank) data. Scores normalized to be in unit interval. Governorates ordered by the sum of the four scores. Governorates classified as facing the Least or Most restrictions in view of clusters and natural breaks in scores, in view of score ranges in other years, and to have 3-4 governorates in each group.

^a Observed variables include: Israeli and Yesha Council settlements, and settler density 2002; and full-time and part-time checkpoints 2004.

^b Observed variables include: house demolitions, adults and minors made homeless 2006; curfew hours and curfew incidents 2005-2006; flying checkpoints 2005-2006; searches and arrests 2005-2006; adult & child fatalities & injuries 2005-2006; and full-time and part-time checkpoints 2005-2006.

^c Observed variables include: house demolitions, adults and minors made homeless 2009-2010; Israeli and Yesha Council settlements, and settler density 2010; population exposed to violence 2010; adult & child fatalities & injuries 2009-2010; and full-time and part-time checkpoints 2009-2010.

^d Observed variables include: house demolitions, adults and minors made homeless 2013-2014; Israeli and Yesha Council settlements, and settler density 2013-2014; and adult & child fatalities & injuries 2013-2014.

Identification strategy 1: Difference in difference estimation

The two alternative measures of mobility restrictions – one time-constant and one time-varying – are linked to the count of various types of establishments, their operating and legal status, location and main economic activity, employment, and female employment. PCA scores for the mobility restriction index for years 2002–2004, 2005–2006 and 2009–2010 are linked to business conditions observed in the 2004, 2007 and 2012 Establishment Censuses, respectively. Because information on mobility restrictions in 1997 is currently missing, the inventory from years 2002–2004 is used as the best available proxy for the relative tightness of the security regime across governorates in 1997. Because relative rather than absolute mobility restrictions are being estimated, this proxy is deemed acceptable.

The following reduced-form regression specification is estimated:

$$y_{it} = \alpha + \beta z_{it} + \gamma x_{it} + \delta t + \rho z_{it} + (e_i + u_{it}) \quad (1)$$

where y_{it} is the outcome of interest of firm i in survey round t , z_{it} is the relative index of mobility restrictions in firm i 's governorate in year t , x_{it} is a set of control variables at the level of firms or governorates, t is a linear trend indicator, e_i is a firm-level unobserved fixed effect, and u_{it} is an idiosyncratic firm-level time-varying shock. z_{it} may be a continuous index or a categorical variable, and may be time-constant or time-varying. $\alpha, \beta, \gamma, \delta, \rho$ are estimable coefficients, and ρ has the interpretation as the difference-in-difference estimator.

To isolate the causal effect of mobility restrictions on firms' status and performance, firms' observable characteristics and conditions in governorates x_{it} are explicitly controlled for. Governorate-industry fixed effects are also used. In waves where it is possible (2007-2012), longitudinal analysis of the intertemporal changes in firms' status and operations is performed. Establishment-level fixed effects are then considered.

In this study, equation 1 is estimated using ordinary least squares regressions for various outcome indicators y_{it} . Alternatively, better tailored estimators could be used for specific variables, such as probit or logit for binary dependent variables such as operating status, tobit for employment size, or multinomial probit for categorical outcomes such as legal status or type of organizational unit.

IV. Data

The study investigates the distribution of various types of establishments, and their operational status and performance at different points in time, under changing mobility regimes imposed by

the Israeli authorities across the Palestinian governorates since the signing of the Oslo II Accord. To this end, various measures of the security regime and mobility restrictions across governorates and years are linked to comprehensive data from the 1997–2012 Establishment Censuses on all Palestinian establishments.

Mobility restriction index

As the previous section described, a static delineation of governorates is first considered as a naïve specification, based only on the November 2015 count of fixed road checkpoints obtained from B'Tselem. For the time-varying PCA index of mobility restrictions, instead, the density of flying checkpoints during 2005–2008 (source: OCHA oPt), and the density of full-time and part-time checkpoints during 2004–2012 (Roy van der Weide, World Bank) are used. As table 2 indicates, there was substantial variation in the security presence in West Bank over time, and the trends differed systematically across governorates.³ For 2005–2014, we also account for Palestinian adults and children killed and injured in direct conflict, excluding in the three Gaza wars. For 2005–2008, we also use curfew hours, curfew incidents, searches and arrests (OCHA oPt). For 2006–2014, we have information on demolished housing units, and adults and minors made homeless. For 2002 and 2010–2014, we also account for the number of Israeli and Yesha Council settlements, and the count of settlers in each (PCBS Settlements Survey 2014, Settlements reports). Finally, for 2010 we use information on the share of population exposed to violence (PCBS Violence Survey 2011). Counts of housing units, curfew incidents, checkpoints and settlements are standardized by governorate area. Counts of persons and searches are standardized by governorate population as of 2014.

Firms' outcomes: Palestinian Establishment Censuses

The Palestinian Establishment Census, administered by the Palestinian Central Bureau of Statistics, covers all economic establishments operating across Palestine without restriction on size. For-profit as well as non-profit organizations, organizations with a business address as well as those operating from homes, and organizations operated by private parties, government or international institutions are all included. Even self-employed individuals are included. The sole

³ Data for Gaza are unavailable. Recognizing the desperate living situation in Gaza due to Israeli blockade and military attacks, we classify all Gaza governorates as facing a harsh security regime and mobility restrictions.

exception omitted from the survey universe in year 2012 is agricultural, forestry, fishing and animal husbandry establishments, while establishments involved in the preservation of meat, seafood and produce are included even in that year. All Palestinian territories with the exception of East Jerusalem are covered.

The 1997, 2004, 2007 and 2012 waves of the Census, with 99,000-170,000 establishment records each, are used, adding up to nearly 520,000 establishment-year records (441,000 in operation). Between the 2007 and 2012 waves, establishment identifiers are linked, allowing longitudinal analysis of firms' coming into existence, attrition, expansion and changes in operations. Out of 117,153 establishments in year 2007, and 132,874 establishments in year 2012, 78,080 are present in both years (156,160 or 62.5% of observations). The 2012 Census is also the latest wave, and is thus our most recent source of insight on the status and operating conditions of firms in Palestine.

The Establishment Censuses report each entity's place of registration (governorate or locality), status as for-profit or non-profit, operating status (operating, temporarily or permanently closed, under preparation or ancillary activity), legal status (sole proprietorship, partnership, shareholding firm, limited liability firm, etc.), organizational arrangement (single unit, head office or branch), main economic activity (13 industry groups; or 4 digit ISIC) and employment (male and female, paid and unpaid). Firms' current capitalization, and owners' demographics – unavailable at the level of individual firms in the publicly available files – can additionally be investigated at the governorate level.

Historical backdrop of the Establishment Censuses

The 1997 Establishment Census was conducted in September 1997 (employment information reference date September 30, 1997) amid sporadic armed clashes on the ground and high-level efforts to enforce the Oslo II Accord of 1995. Three years later, in September 2000, the Second Intifada broke out. The second Establishment Census was originally planned for 2002, but had to be postponed until the security situation allowed it and Israeli restrictions people's mobility were softened (PCBS 2004). The Census was conducted during the 2004-2005 winter (reference dates 28/11/2004-25/01/2005), after the worst fighting of the Second Intifada had passed. The Intifada ended and trade restrictions were partially lifted in summer 2005, but in the West Bank, restrictions on movement and trade stayed. The number of road checkpoints within West Bank kept rising. The 2007 Establishment Census was conducted during a period of relative political stability but of

unrelenting restrictions on the ground, effectively fragmenting Palestinian markets, increasing firms' costs of operation and dashing their prospect of attaining prosperity. Fieldwork for the Census was conducted at the originally scheduled time, during October 20–November 10, 2007 (reference date September 30, 2007) – and thus only three years after the prior Census.

In 2008 hostilities between Hamas and Israel in Gaza intensified again, leading up to the January 2009 Gaza War (a.k.a., Israeli Operation Cast Lead). Humanitarian situation in Gaza deteriorated, leading to “a massive destruction of livelihoods and a significant deterioration of infrastructure and basic services” for Palestinians (UN-OCHA 2009). A period of reconstruction followed interrupted only in March and November 2012 by outbreaks of violence. The 2012 Establishment Census was administered in between of these outbreaks, from September 3 to October 24 (reference date August 31), in a period of relative stability but uncertainty.

This overview suggests that the intensity of mobility restrictions varied significantly across Palestinian territories and across years, and that various firms surveyed in the four Establishment Censuses were likely affected differently depending on their location.⁴

V. Results

Section III introduced two methods for identifying the effect of mobility restrictions on firms' status and performance – quantifying the mobility restrictions and isolating their effects on firms – using data described in section IV. This section reports the main results of the two analyses, evaluates the corresponding hypotheses *H1*, *H2a* and *H2b*, and reports other trends in the composition of the Palestinian economy and firms' characteristics across governorates and over time. The concluding paragraphs will discuss robustness of the analysis, and economic implications of the main findings.

Index of mobility restrictions

Tables 1 and 3 show the basic classification of the security regime imposed by the Israeli forces across Palestinian governorates: the estimated restriction scores, and the classification of governorates as most, medium or least affected by the restrictions.⁵ Comparing tables 1 (static

⁴ However, nothing in the available documentation suggests that survey fieldwork and processing were affected by security concerns. The differences we uncover in firms' status and performance can be attributed to the circumstances in which firms operate, not to survey design or implementation.

⁵ Scores in table 3 were computed using PCA of the contributing vectors of mobility restrictions in each year. Appendix 3 presents selected additional statistics on the performance of the PCA: relative performance of the first

checkpoint index) and 3 (PCA relying on dynamic factors), we find that the ranking of West Bank governorates is similar. Tubas and Jericho consistently rank as having the lowest densities of flying and permanent checkpoints during 2004-2012, while Bethlehem, Hebron, Qalqiliya and Tulkarem score as having the highest densities. This lends some support to the static classification in table 1. However, there are some notable exceptions. Salfit ranks among the least affected governorates in 2015, but among the medium group in 2010 and 2014, and among the most affected group in 2004 and 2006. Hebron, on the other hand, ranked among the least-affected areas in 2004-2006, but started ranking high in 2010. Tulkarem, similarly, ranked as least affected in 2004, 2010 and 2014, but as most affected in 2006 and 2015. The fact that the classification of a number of governorates changes over time facilitates the identification of the effects of security measures on economic outcomes, since the outcomes cannot be due to unobserved time-constant effects of selected governorates. In the following analysis, the time-varying index of mobility restrictions is used as a benchmark specification.⁶

The effect of mobility restrictions on establishments' outcomes: longitudinal analysis (2007-2012)

For a balanced panel of 78,080 firms, we observe firms' status and operations across two years, 2007 and 2012.⁷ For these firms we have a unique opportunity to observe the effects of security conditions, or the firms' responses to those security conditions, untainted by the changing composition of the sample of establishments in the two years. We can also explicitly control out the effects of firms' unobserved heterogeneity by including firm fixed effects.

Table 4 presents selected OLS and panel-method regressions of firms' employment, female employment, and female share among firms' workforce. Because of the large sample sizes, many coefficients are highly significant even though their magnitudes are close to zero. Across all models estimated, we consistently find that a higher degree of mobility restrictions is associated with a reduction in firms' scale in terms of workforce. This is the case for total employment, female employment, as well as the ratio of women among establishments' workforce. This finding

versus the second principal components (figure A1), loadings of individual vectors of mobility restrictions (figure A2), and governorate scores under the first versus the second principal component.

⁶ Results for the time-constant (year 2015) index are available on request. These results agree qualitatively with the main correlation and regression results in the text, but they appear more noisy and less significant, because the time-constant index does not take into account differential time trends in mobility restrictions across governorates, and effectively simply correlates the time-average of firms' outcomes and the time-constant mobility restriction index.

⁷ By contrast, 54,794 establishments were newly added in 2012, and 39,073 were surveyed in 2007 but not in 2012. For these firms it is unclear whether they became newly established or defunct, or whether they slipped out of the survey universe or simply failed to respond to the survey in one year.

remains valid and highly significant even when firm-level effects are taken out, a highly intrusive approach in a dataset with such a high cross-sectional dimension and only two time periods. The result thus appears highly robust. The analogous analysis performed on all Census rounds pooled together confirms this. Across all four survey rounds, and across establishments that appear only in a subset of rounds, there is evidence that mobility restrictions are detrimental to firms' size and employment. Refer to table 5. Moreover, table 5 also reports on a regression of the operating status of establishments. Units facing tighter security regimes in their location are systematically less likely to be in active operation, suggesting that they temporarily or permanently close, or they work on restructuring their operations by engaging in preparatory or ancillary activities.

Taken together, the findings across all columns of table 5 suggest that mobility restrictions are damaging to employment in Palestine for several reasons. One, firms that survive respond to economic challenges by holding on to fewer workers. Two, some firms do not survive, or they enter a hibernating period in which they engage in peripheral activities, hoping to weather the worst crisis and to reemerge in a brighter future. These firms are not properly included in the Census, and their omission is likely to underestimate the gravity of the effect of mobility restrictions on economic activity. Finally, vulnerable workers such as women are likely to be affected more seriously than other workers. Like many prior worldwide studies have documented, female workers are the first to be fired, and the last to be rehired. Our findings in tables 4 and 5 support this narrative.

Could firms that disappeared from the Census at one point or another have simply changed industry or location, and become more successful there? For firms that we observe at multiple points in time, in the 2007-2012 panel, we find that 16.8% changed their main economic activity, but only a handful changed governorates. All but 30 remain in the same governorate across the two years, and 48,878 (or 62.6%) operate in the same governorate and engage in the same main economic activity between the two years. There is no evidence that establishments try to escape mobility restrictions in one governorate for another governorate – or more technically that they would succeed at escaping. Firms that change industry or government do not appear to expand in size compared to firms that stay behind. Hence, firms that disappear from the Census at some point, as well as workers whom they used to hire, are likely to be victims of economic challenges.

In sum, our results indicate that the employment at Palestinian establishments is sensitive to the multitude of domestic and cross-border mobility restrictions. This result holds even for female employment alone, or for female share of firms' employment. This corroborates evidence that

most Palestinian economic sectors have been weakened by restrictions on the movement of Palestinian residents and resources within the occupied territory as well as across its borders, particularly in the initial years of the Second Intifada (years leading up to 2004), at the onset of the blockade of Gaza, and following Israeli military operations in Gaza in 2008 and 2012. Entrepreneurs responded to the red-tape and transaction costs and risks by postponing opening/expansion of their businesses, or by early closures, to the detriment of the Palestinian economy at large. The ongoing construction of the separation wall in West Bank and the systematic demolition and confiscation of Palestinians' property exacerbate the degree of Israel's encroachment on Palestinian livelihoods, and adversely affect the prospect of economic rebirth.

Table 4. Panel methods regressions of firms' employment: firms matched between 2007 & 2012

	Log(employment)		Log(female employment+1)		Female share of employment	
	OLS	FE	OLS	FE	OLS	FE
Time-varying mobility restrictions	-0.007*** (0.002)	-0.008*** (0.002)	-0.009*** (0.001)	-0.002* (0.001)	-0.002** (0.001)	-0.002** (0.001)
Year (2012=1)	0.020*** (0.003)	0.027*** (0.003)	-0.040*** (0.002)	0.004*** (0.001)	-0.021*** (0.001)	0.001 (0.001)
Privately owned	0.119 (0.151)	0.021 (0.292)	-0.149 (0.152)	-0.185 (0.142)	0.088 (0.135)	0.025 (0.055)
Publicly owned	0.419*** (0.152)	-0.103 (0.293)	0.470*** (0.152)	-0.166 (0.145)	0.309** (0.135)	0.057 (0.056)
Single unit	0.779*** (0.147)	0.862*** (0.278)	0.289* (0.151)	0.346** (0.135)	-0.043 (0.135)	0.001 (0.052)
Head office	1.426*** (0.148)	1.009*** (0.279)	0.550*** (0.152)	0.414*** (0.135)	-0.030 (0.135)	0.007 (0.052)
Company branch	0.940*** (0.147)	0.823*** (0.279)	0.376** (0.152)	0.346** (0.135)	-0.025 (0.135)	0.003 (0.052)
Sole proprietorship	-0.446*** (0.010)	-0.148*** (0.009)	0.006 (0.006)	-0.016*** (0.004)	0.040*** (0.003)	-0.001 (0.002)
Partnership	0.049*** (0.013)	0.010 (0.012)	0.014* (0.008)	-0.005 (0.006)	0.012*** (0.004)	-0.002 (0.003)
Shareholding firm	0.675*** (0.024)	0.057*** (0.020)	0.278*** (0.017)	0.042*** (0.012)	0.032*** (0.004)	0.007 (0.004)
Limited/unlimited liability	0.457*** (0.054)	0.068 (0.055)	0.031 (0.027)	-0.002 (0.028)	0.023** (0.009)	0.002 (0.009)
12 ind. indicators	Y***	Y***	Y***	Y***	Y***	Y***
15 gov. indicators	Y***	Y***	Y***	Y***	Y***	Y***
Establish. fixed effects		Y		Y		Y
Constant	0.853*** (0.056)	-0.720* (0.405)	-0.155*** (0.028)	-0.388 (0.283)	-0.036 (0.024)	0.042 (0.108)
Observations [estabs.]	139,823 [78,080]		139,823 [78,080]		139,823 [78,080]	
Within R-squared	0.270	0.020	0.256	0.006	0.147	0.001

Notes: Sample restricted to non-agricultural firms surveyed in both 2007 and 2012.

Standard errors in parentheses are corrected for arbitrary heteroskedasticity and autocorrelation at the firm level. Significant at * 10%, ** 5%, *** 1% using two-sided tests.

Table 5. OLS regressions of firms' employment: pooled cross sections of all Census rounds

	Log(employment)	Log(female employment+1)	Female share of employ.	Operating
Time-varying mobility restrictions	-0.011*** (0.002)	-0.006*** (0.001)	-0.008*** (0.001)	-0.001*** (0.000)
Year (2012=1)	0.040*** (0.001)	0.009*** (0.001)	0.008*** (0.000)	0.001*** (0.000)
Privately owned	0.110 (0.097)	-0.051 (0.086)	0.104 (0.082)	0.195*** (0.040)
Publicly owned	0.349*** (0.098)	0.472*** (0.087)	0.290*** (0.082)	0.198*** (0.040)
Single unit	0.830*** (0.096)	0.226*** (0.085)	-0.032 (0.082)	0.055 (0.037)
Head office	1.457*** (0.097)	0.470*** (0.086)	-0.017 (0.082)	0.056 (0.037)
Company branch	0.990*** (0.097)	0.313*** (0.085)	-0.011 (0.082)	0.057 (0.037)
Sole proprietorship	-0.476*** (0.006)	-0.049*** (0.004)	0.017*** (0.002)	0.005*** (0.001)
Partnership	-0.007 (0.009)	-0.047*** (0.006)	-0.014*** (0.003)	0.004*** (0.001)
Shareholding firm	0.560*** (0.015)	0.192*** (0.010)	0.012*** (0.003)	0.003*** (0.001)
Limited/unlimited liability	0.462*** (0.044)	0.045* (0.027)	0.017** (0.008)	0.008*** (0.001)
Operating	-0.114** (0.055)	-0.009*** (0.003)	-0.010 (0.015)	
12 ind. indicators	Y***	Y***	Y***	Y***
15 gov. indicators	Y***	Y***	Y***	Y***
Constant	0.129 (0.080)	-0.004* (0.002)	-0.038 (0.023)	0.253*** (0.003)
Observations	300,771	322,614	300,770	322,615
R-squared	0.264	0.238	0.136	0.720

Notes: Sample restricted to non-agricultural firms.

Standard errors in parentheses are corrected for arbitrary heteroskedasticity and autocorrelation at the firm level. Significant at * 10%, ** 5%, *** 1% using two-sided tests.

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Appendix 1: Data description

The survey unit of the Establishment Census is the economic establishment. Data are self-weighted. The 2013 System of National Accounts defines the establishment as an enterprise or part of an enterprise in which one group of goods and services is produced, even if secondary activities are conducted in that establishment (PCBS 1997).

The public versions of the four rounds are not entirely harmonized. For one, different rounds of the census contain different variables. Refer to table A1. Two, values that variables take are common between two or three rounds, but not always across all four waves. It is thus impossible to use all variables in cross-round comparisons. Three, samples are not exactly comparable across the four rounds. The 2007 round is restricted to presently operating firms, while other rounds contain non-operating units (temporarily or permanently closed, engaged in ancillary activities, or under preparation), or even units that did not complete survey interviews.

The operational status takes five possible values: operation, permanently closed, temporarily closed, under preparation, or auxiliary activity unit. Ownership can be private national, private foreign, national government corporation, foreign government corporation, central government, local government, foreign government, UNRWA, or international body. Economic organization is either a single establishment, head office or branch. For the legal status, the 1964 Jordanian law is used in the West Bank, while the 1929 Palestinian law is used in Gaza. The possible responses are: sole proprietorship, de facto company, partnership company, shareholding company, limited or not limited company, and others. Principal economic activity is the activity generating the majority of value added for the establishment according to the International Industrial Classification of all Economic Activities, first revision (ISIC-1), coded at the four digit level. Employment includes both paid employees and unpaid owners and family members. It includes also all permanent and temporary staff aged 10 years and older.

Table A1. Basic descriptive statistics for the included surveys

Census round	Sample size (completed interview)	In operation	Workers covered by presently operating firms ⁱ	Fieldwork [ref. date for employees]	Variables
1997	98,900	82,165	190,542 (192,205 including non-operating firms)	Dec 10-24, 1997 [Sep 30, 1997]	Governorate, operational status, ownership, profit/nonprofit, economic organization – unit, legal status, principal econ. activity (13 groups), male & female employment
2004	117,153	103,846	257,588	Nov 28, 2004 -Jan 25, 2005 [Nov 28, 2004]	Interview result, governorate, locality, operational status, ownership, economic organization – unit, legal status, principal econ. activity (4-digit), male & female wage/non-wage employment
2007	132,874	109,686 ⁱⁱ	297,056	Oct 20-Nov 10, 2007 [Sep 30, 2007]	Governorate, ownership, economic organization – unit, legal status, principal econ. activity (13 groups, 2- & 4-digit), male & female employment
2012	169,531	144,969	385,264	Sep 3-Oct 24, 2012 [Aug 31, '12]	Governorate, ownership, economic organization – unit, legal status, principal econ. activity (4-digit), male & female employment

ⁱ This is likely to double-count workers with multiple jobs (particularly non-wage workers).

ⁱⁱ The available sample is restricted to interviewed and presently operating firms. Information on other firms is only available from PCBS (2008).

Table A2. Descriptive statistics for main variables in the included surveys

Types of establishments	1997	2004	2007	2012 ⁱ
Establishments with active operations (%)	81.97	88.21	87.91 ⁱⁱ	85.51
Establishments temp/perm closed (%)	9.86	5.09	6.61	13.72
Establishments under preparation (%)	8.17	0.99	0.48	0.77
Private firms, not NGOs or public (%)	76.60	90.53	96.30	91.07
Sole proprietorships (%)	66.96	82.45	85.61	85.47
Shareholding companies (%)	1.99	1.41	1.89	2.02
Single unit firm, not main office or branch (%)	71.63	93.55	94.85	90.59
Main office, not single unit or branch (%)	1.50	2.34	1.88	2.22
Manufacturing (%)	16.36	13.47	14.94	12.36
Wholesale, retail & repair (%)	42.75	56.22	57.69	51.10
Establishments with up to 9 employees (%)	97.41	97.07	96.84	96.58
Establishment employment (#)	1.97	2.68	2.75	2.91
Establishment employment, private estblshmts. (#)	2.57	2.50	2.52	2.71
Female share of employment (%)	9.8	9.9	12.8	13.1
Female employment share, private estblshmts. (%)	9.8	9.0	11.7	12.2
Employment concentr. (mean 0-1 HHI index by ISIC-4 sector)	0.006 ⁱ	0.20	0.14	0.25

Non-agricultural establishments	92,821	112,820	102,710	169,531
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Year 1997-2007 samples restricted to non-agricultural establishments, for comparability with the 2012 survey wave, which excludes agricultural establishments. (Agricultural establishments account for 6.15, 5.66 and 6.36% of all establishments in waves 1997-2007.)

ⁱ Evaluated across 12 industry groups (excluding agriculture), since more detailed industry classification is unavailable.

ⁱⁱ In 2007, share of establishments under operation/closure/preparation was evaluated in full sample, including agricultural establishments, as per PCBS (2014), since microdata is available only for operating establishments.

'97'04

Table A3. Descriptive statistics for main variables, by governorate ('07'12)

Governorate	Active operations	Sole proprietor.	Single unit firms	Manufact.	Trade	Up to 9 employees	Avg. employees	Female share	Employ. concentr. ⁱ
Jenin	82.8 82.7 85.8 78.0	62.7 86.5 91.6 89.8	71.1 95.8 97.8 93.2	12.4 13.3 13.7 11.3	48.1 59.4 61.1 54.4	98.3 98.3 97.9 98.1	1.6 2.1 2.1 2.3	10.7 11.4 15.0 16.7	.04 .33 .38 .33
Tubas	91.4 71.8 85.4 71.6	76.1 90.0 91.7 89.1	79.9 96.9 97.1 95.2	10.7 11.3 12.1 10.0	53.2 62.4 64.3 54.3	99.5 99.3 99.1 98.3	1.3 1.7 1.8 2.1	8.2 10.8 15.8 19.3	.14 .37 .45 .40
Talkarm	81.1 87.8 85.9 79.4	67.8 79.1 82.6 87.5	72.2 96.2 96.4 91.9	13.5 12.9 14.7 12.0	45.4 58.0 58.8 52.9	97.7 97.8 97.5 97.2	1.7 2.2 2.4 2.4	11.6 13.9 16.2 17.0	.05 .40 .43 .38
Nablus	94.3 81.3 84.8 81.9	80.8 77.3 82.1 81.7	83.8 90.7 93.7 88.9	20.9 16.0 18.0 16.0	47.3 56.4 56.4 50.6	98.9 97.2 97.1 96.4	1.5 2.7 2.7 2.9	15.6 11.1 13.7 14.2	.25 .35 .34 .32
Qalqilya	78.4 85.7 86.9 78.7	61.8 82.7 87.8 87.5	68.1 95.7 97.1 94.1	19.3 13.7 17.7 14.2	39.3 56.5 59.1 50.0	97.2 97.7 97.3 97.8	2.1 2.2 2.4 2.3	9.7 11.1 14.4 16.5	.08 .36 .41 .38
Salfit	87.5 93.1 91.0 75.6	69.4 87.6 90.7 93.1	75.7 96.9 96.9 92.8	14.4 14.3 17.6 15.7	47.1 55.9 57.1 46.7	98.0 98.3 97.9 97.4	1.7 1.9 2.1 2.3	11.7 18.1 19.0 22.6	.08 .35 .47 .33
Ramallah & Al-Bireh	85.1 88.7 89.2 90.0	64.1 70.8 78.1 80.3	72.1 90.6 91.9 88.8	15.7 12.8 14.7 11.0	39.5 50.2 50.3 44.7	96.5 95.6 94.8 94.0	2.6 3.5 3.8 4.3	13.7 15.4 17.6 17.8	.11 .36 .37 .36
Jericho & Al Aghwar	86.4 85.6 89.8 82.4	75.1 78.5 84.9 79.6	78.0 90.1 92.9 87.7	22.6 9.4 10.6 7.4	45.1 51.4 55.5 46.8	96.9 96.5 95.7 95.4	2.3 2.6 3.1 3.4	11.8 10.9 15.6 19.1	.13 .41 .47 .41
Jerusalem	75.6 90.9 92.6 94.7	57.2 86.1 90.1 94.0	57.4 93.4 95.9 91.5	8.4 12.2 19.8 10.6	33.3 58.0 54.9 52.2	97.1 95.6 96.6 95.8	1.7 3.3 2.7 3.3	15.8 7.5 12.2 12.8	.18 .43 .48 .37
Bethlehem	85.7 89.9 90.4 81.4	69.3 80.2 85.2 82.8	75.1 95.8 96.6 92.0	21.5 17.3 20.0 15.6	39.4 52.2 52.4 46.4	95.5 96.0 95.1 95.1	2.6 2.9 3.2 3.3	16.0 14.9 17.7 19.2	.11 .44 .39 .38
Hebron	83.1 93.0 90.4 84.0	69.8 80.8 84.7 85.0	72.3 93.7 95.1 91.9	20.2 15.1 16.9 14.8	43.3 57.5 59.2 52.1	97.7 97.4 96.9 97.1	1.9 2.5 2.7 2.6	7.4 8.8 11.4 12.2	.05 .37 .31 .31
North Gaza	80.3 90.7 88.0 83.1	68.7 86.8 87.9 86.9	71.6 93.6 94.2 91.7	14.0 13.1 11.0 11.1	45.6 58.1 63.0 54.3	97.3 96.8 97.5 96.9	1.8 2.8 2.5 2.7	9.8 8.6 10.4 9.3	.08 .35 .43 .33
Gaza	87.5 91.7 86.7 91.4	73.2 84.7 84.4 85.4	77.1 92.6 92.6 87.5	16.8 13.1 12.7 11.6	45.9 56.3 59.0 52.5	96.5 96.4 96.0 95.8	2.3 3.1 3.2 3.4	6.1 5.9 8.0 7.7	.03 .29 .27 .27
Deir Al-Balah	74.9 84.5 86.0 92.4	64.2 89.4 91.4 83.5	66.5 94.4 95.6 90.5	11.7 10.5 10.2 9.95	39.8 55.7 60.2 49.8	98.7 97.9 98.0 97.7	1.3 2.4 2.4 2.6	6.4 6.9 10.1 8.6	.06 .36 .36 .32
Khan Younis	69.3 93.3 90.0 94.3	58.9 90.7 90.7 88.7	61.6 94.5 95.1 89.1	10.3 10.8 11.4 9.5	36.9 54.4 57.9 51.6	98.6 98.4 98.2 98.1	1.4 2.2 2.4 2.4	7.7 6.5 8.4 7.8	.06 .34 .37 .32
Rafah	73.3 88.3 90.1 90.5	64.5 87.2 90.0 86.0	66.3 95.4 97.1 91.1	9.3 8.4 8.3 8.2	41.0 57.1 60.5 54.3	98.9 97.8 98.0 98.1	1.3 2.4 2.3 2.3	6.7 5.9 8.0 8.1	.09 .37 .43 .29

Year 1997-2007 samples restricted to non-agricultural establishments, for comparability with the 2012 survey wave, which excludes agricultural establishments.

-- not available.

ⁱ Evaluated across 12 industry groups (excluding agriculture), since more detailed industry classification is unavailable.

ⁱⁱ In 2007, share of establishments under operation was evaluated in full sample, including agricultural establishments, as per PCBS (2014), since microdata is available only for operating establishments.

Appendix 2: Principal component analysis of mobility restrictions

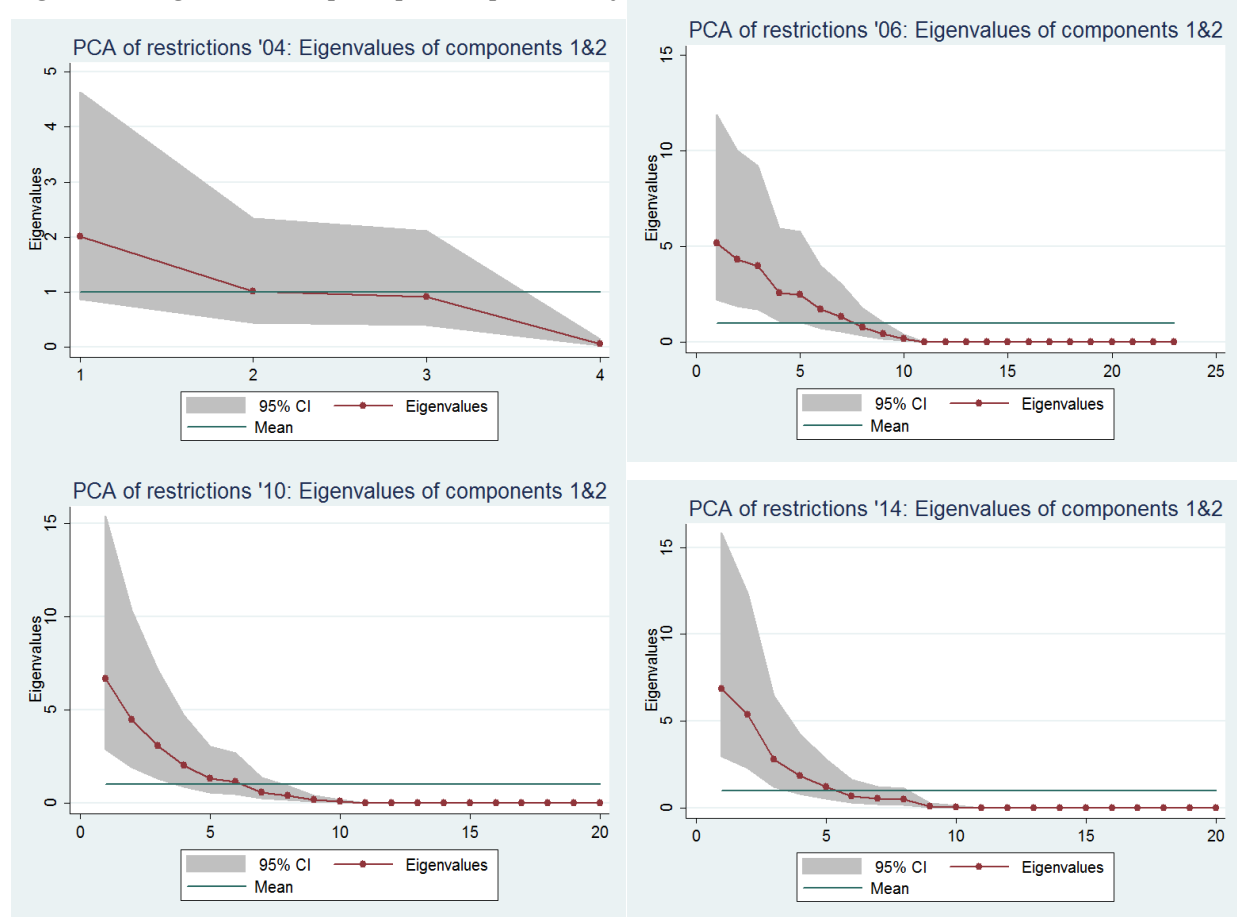
Mobility restrictions take many forms, and have various implications for businesses, their suppliers and workers, and their clients. As an alternative to using a single or multiple indicators for the restrictions, we compute a one-dimensional index of the burden of mobility restrictions in

each governorate and year based on the multiple forms of restrictions on mobility and business operations under the Israeli occupation. The mobility-restriction index is obtained from the first component in the principal component analysis of all observable forms of restriction. This first component can be expressed as the weighted sum of the individual forms of restrictions (numbering p forms of restriction), where restriction indicators are standardized by the mean and standard deviation across governorates, and where the weights (a_p) are selected to maximize sample variance of the index subject to $\sum_p a_p^2 = 1$:

$$w = \sum_p a_p \frac{(x_p - \bar{x}_p)}{stdev(x_p)} \quad (1)$$

The principal component method assigns the highest weights to mobility restrictions that vary most across governorates in a year, thus informing on maximum discrimination in business operating conditions between governorates. The available data have several notable limitations that affect the usability and interpretation of the obtained mobility-restriction index. Observable restrictions vary across census rounds. As a result, we must use relative scores of the restrictions index rather than the absolute scores of the index in cross-year analysis. Several dimensions of mobility restrictions are notably missing from our analysis for lack of consistent data, including the presence of Israeli armed personnel on the ground, or the typical time delay caused by various checkpoints and truck-reloading border facilities.

Figure A1. Eigenvalues of principal components, by year



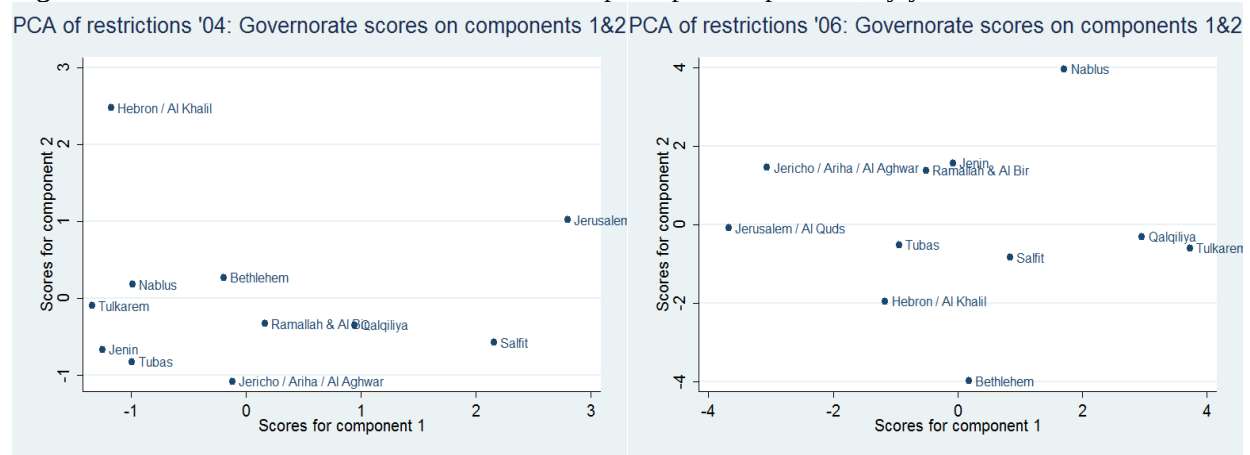
Notes: Mean is unity. Confidence interval assumes asymptotic distribution.

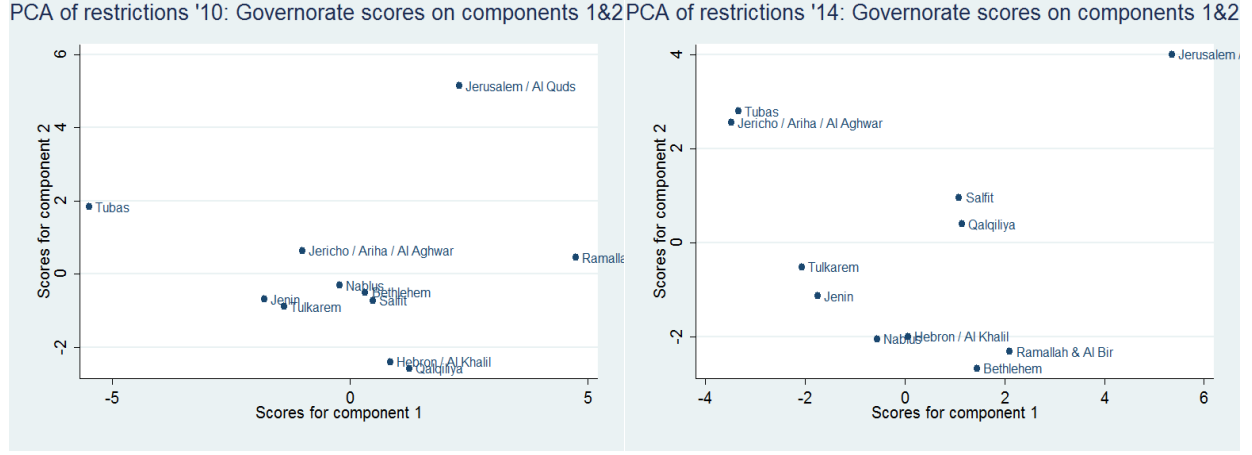
Figure A2. Variable loadings to the first two principal components, by year



Notes: Loadings are distributed from -1 to +1, and add up to +1 for each component, interpreted as shares of indicators' variability accounted for by the component ($\times 100\%$).

Figure A3. Governorate scores under the first two principal components, by year





Future extension: dynamic principal component analysis

To improve on the method used in this study and in existing literature, and take advantage of the panel nature of our mobility-restrictions data, we will consider dynamic principal component analysis (DPCA), taking into account variation in mobility restrictions in each governorate across years, rather than just across governorates. The benefit is that PCA will thus be estimated on all years of data jointly, and PCA scores will be estimated consistently across years. Their absolute distribution across all years, rather than just their relative distribution (i.e., governorate ranking) in each year, will be linked to firms' status, performance and behavior. DPCA estimates the structure of variation in the data more correctly by combining cross-sectional variation, through static PCA, with time-series variation, through linear regression (Federici & Mazzitelli 2005).

To perform DPCA, governorates are ranked based on their first factor estimate from PCA on the entire dataset, and the evolution of the factor across years is presented for each governorate. To measure the variability of our factors, P variables, N governorates and T years are used, and the overall variability is decomposed into variability across governorates, and variability over time: $X_{it} - \bar{X} = (X_{it} - \bar{X}_t) + (\bar{X}_t - \bar{X})$, where X_{it} is a vector of the actual stock of all forms of mobility restrictions of governorate i in year t , $\bar{X}$ is mean stock of restrictions across all governorate-year observations, and $\bar{X}_t$ is the mean stock across all N governorates in a year. Overall dispersion in data is given by

$$S = \underbrace{\frac{1}{NT} \sum_{i,t} (X_{it} - \bar{X}_t)(X_{it} - \bar{X}_t)'}_{S_T} + \underbrace{\frac{1}{NT} \sum_{i,t} (\bar{X}_t - \bar{X})(\bar{X}_t - \bar{X})'}_{S_{*T}} + \underbrace{\frac{2}{NT} \sum_{i,t} (X_{it} - \bar{X}_t)(\bar{X}_t - \bar{X})'}_0 \quad (1)$$

The total variability in X_{it} can thus be written as $S = S_T + S_{*T}$ where S_T is a $P \times P$ variance-covariance matrix of indexes reflecting the within-year variability of the indexes, while S_{*T} is a variance-covariance matrix of indexes reflecting the between-year variation in the data.

Appendix references

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