The Flight of White-Collars:

Civil Conflict, Availability of Medical Service Providers and Public Health[1]

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Abstract

Analyzing novel data sets from Turkey, we provide empirical evidence for our theoretical argument that a major mechanism through which civil conflicts exert their long term negative influences on public health is by discouraging medical personnel to practice in conflict regions. We show that the long running civil conflict in Turkey has been driving away doctors and other highly trained medical personnel from conflict areas, and that availability of medical personnel is positively associated with public health. We then assess the effectiveness of certain policy measures that have been tried out by Turkish governments over the years to counteract the negative impact of the

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conflict on medical personnel availability. We show that while extra pay policies do not provide much relief, mandatory service requirements do serve as effective counter measures.

1. INTRODUCTION

Civil conflicts have both immediate and long-term effects on social well-being. There is the immediate sufferings in the form of casualties, displacements, the destruction of infrastructure and property, and then there are the indirect and longer term negative impacts on health, education, economic activity, and social cohesion and trust. Indeed, there are good reasons to presume that the indirect consequences of conflict are much more important and substantial in many cases than the direct ones. Lacina and Gleditsch (2005) concur that direct conflict fatalities "do not provide a remotely adequate account of the true human costs of conflict". Furthermore, as Blattman and Miguel (2010) argue in their detailed review of the literature on civil conflicts, existing studies only scratch the surface of the range of possible impacts on the economy and society, and thus we are still far from a complete understanding of the true extent of the damages civil conflicts inflict upon host societies. The important question is not whether these conflicts harm societies, but rather in what ways, how much, and how persistently—all crucial questions for understanding the impacts on economic, political and social development, as well as priorities for post-conflict assistance.

This study contributes to the literature that aims to answer these crucial questions. By analyzing two novel data sets from Turkey, we provide empirical evidence for yet another negative consequence of civil conflicts. We show that the long running civil conflict in Turkey has been driving away doctors and other highly trained medical personnel from conflict areas, and that availability of medical personnel is positively associated with public health. By doing so, we illuminate an important, yet never analyzed before mechanism through which civil conflicts exert their long-term negative influences on the most important "life chance" of societies (Boop and Ford, 2010), namely, the chance to lead a healthy life. We then proceed to assess the effectiveness of certain policy measures that Turkish governments have tried out over the years to intervene in the medical labor market to offset the disparity between the conflict zone and other parts of the country in terms of the availability of health practitioners. We show that while paying more does not really seem to work, mandatory service requirements do give a boost to doctor counts even though they are not able to stop the flight out of conflict areas.

As we discuss in the next section, there is an emerging literature which has already firmly established that civil conflicts give long term damage to public health in host societies. The ebola outbreak in sub-saharan Africa constitutes the latest dramatic example. Of the 32 sub-Saharan African states to have experienced internal armed conflict since 1976, nearly a third have also experienced Ebola outbreaks. In fact, the virus appears to be tracking ongoing and recent civil wars in the Democratic Republic of Congo (1976), Gabon (1996), Uganda (2000), Gabon again (2001), Congo (2002) to today's outbreak in West Africa (Fazal, 2014; Maxman, 2014). What we need at this point is to develop a thorough understanding of the mechanisms through which civil conflicts damage public health so that we can devise effective counteractive policies. We argue that the flight of medical personnel from conflict areas is one such mechanism which, despite its importance, has not received much scholarly attention yet. While there are studies which have theoretically acknowledged the existence of such a mechanism, to our knowledge, this is the first study to provide empirical evidence of the flight of doctors and other highly trained health practitioners away from areas where the fighting takes place. The main reason why the issue has so far been left unexplored is the lack of data. The fundamental challenge in conducting empirical studies of the adverse impacts of civil conflicts is that information systems, particularly civil registration systems that record the indicators of social well-being, often cease to function in societies affected by the conflict. Another commonly encountered problem is the reluctance of officials to share information in an effort to hide the true extent of the damage caused by the conflict. Consequently, it is not surprising that data on the availability of health practitioners across locations and time is hard to come by for states with civil conflicts.

The second major contribution of our study is its provision of such a data set for Turkey. Through extensive research on Turkish State Archives, we have constructed an interesting data set that includes yearly information on the number of doctors, nurses, dentists, midwives, and health technicians across provinces in Turkey between 1964 and 2010, along with some important public health indicators. This panel data, which spans an impressive 46-year period, enables us to analyze whether the Kurdish-Turkish armed conflict that has been going on since 1984 has had any impact on the availability of the medical personnel in the provinces where the fighting has been taking place. The results reveal a significant negative impact. We then analyze the association between the availability of medical personnel and public health indicators. The significant positive associations we find indicate that the negative impact of civil conflicts on the availability of medical personnel is a very important mechanism through which these conflicts exert their long-term negative influences on public health. We also analyze two different policies employed by the Turkish governments over the years, and investigate whether those policies proved effective in halting the flight of the medical personnel out from the conflict areas and thus, in improving public health. We believe this exercise provides important clues for developing effective counteractive policies.

In the following section, we look into the literature on the effects of civil conflicts on public health. In the third section, we briefly discuss the Turkish case. In the fourth section, we present our data. We present our models and results in the fifth and sixth sections, and conclude in the seventh.

2. PUBLIC HEALTH AND CIVIL CONFLICTS

Civil conflicts are humanitarian disasters, and the immediate sufferings in the form of displacements, casualties, and destruction of infrastructure and property are only “the tip of the iceberg of their longer-term consequences for human misery” (Ghobarah, Huth and Russett, 2003). Carlton-Ford and Boop (2010) sum these long-term adverse consequences as the negative impacts of civil conflicts on “life chances” by which they mean the well-being of civilian populations and the development of human capabilities. In their analyses they focus on the impact of civil conflicts on what they deem to be the most important of these life chances, namely, health, economic welfare, and education.

In recent years, a growing body of literature has assessed the impact of conflict on public health outcomes. Ghobarah, Huth and Russett (2003) empirically demonstrate the long term damaging effects of civil conflicts on the ability of civilian populations to lead a disability-free life. Guha-Sapir and Van Panhuis (2003) demonstrate that in host societies mortality rates are higher after civil conflicts than before. Similarly, Hoeffler and Reynal-Querol (2003) find a highly persistent increase in child mortality rates in conflict areas. Li and Wen (2005), and De Walque and Filmer (2012) come up with a similar result for adult mortality. Akresh et al. (2009) study the Rwandan case, and reveal the stunting effect the civil conflict has on the physical development of children. Davis and Kuritsky(2002) show that in sub-Saharan Africa countries which have experienced violent conflict have significantly worse health outcome indicators compared to countries that have been at peace. Iqbal (2006) studies the health adjusted life expectancy (HALE) in states member to the World Health Organization and reveals the extent of damage armed conflicts have on this summary measure of public health. Degomme and Guha-Sapir (2010) study Darfur and argue that more than 80% of excess deaths were the result of an increased spread of disease, which in turn drive up infant mortality rates. Relatedly, Berrang-Ford, Lundine and Brau (2011) associate the reemergence of the Human African Trypanosomiasis disease in sub-Saharan Africa with the armed conflicts in the region. Finally, Gates, Hegre, Nygard and Strand (2012) conduct an analysis of the effect of armed conflict on progress in meeting the United Nation’s Millennium Development Goals and demonstrate that conflict has clear detrimental effects on the reduction of poverty and hunger, on primary education, on the reduction of child mortality, and on access to potable water.

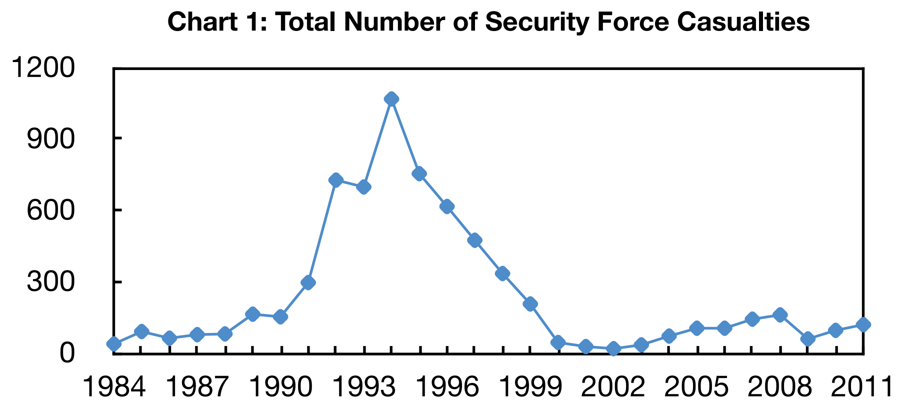
In short, there is ample evidence of the detrimental impacts of civil conflicts on public health. Nevertheless, we still do not have a complete understanding of the mechanisms through which these damages occur. This kind of understanding is extremely important for formulating effective policies to counteract these effects. While existing works offer theoretical discussions on possible mechanisms, there are very few studies that actually provide empirical evidence of those mechanisms discussed and the extent of the damage created by them. One very comprehensive discussion is offered by Ghobarah, Huth, and Russett (2003; 2004). They list the destruction of infrastructure such as hospitals, roads, water supply, and power grids; the increased risk of exposure to diseases due to displacement of large populations and due to crowding, bad water, and poor sanitation in refugee camps, along with malnutrition and stress which compromise people's immune systems; the lack of public and private financial resources for expenditures on health care due to economic hardship; the diversion of economic resources from public health to military uses; the reduction in the efficient use of resources allocated to public health; and finally the depletion of human resources needed for health care due to the flight of highly trained medical professionals from conflict areas as the main mechanisms behind the detrimental impact of civil conflicts on public health. Iqbal (2006) adds to this list the disruptions in agricultural production which may then lead to widespread famines.

In this study we focus on the flight of highly trained medical personnel from conflict areas, and provide empirical evidence from the Turkish case demonstrating how the ongoing civil conflict is negatively associated with the number of health practitioners across provinces. We then proceed to present empirical evidence on the positive link between the availability of health practitioners and public health which allows us to argue that one mechanism through which civil conflicts hurt public health is by driving away medical personnel from conflict areas. To our knowledge this is the first study to focus on this important dynamic. Finally, we analyze two specific policies that Turkish governments have tried out over the years to see whether those policies proved effective in halting the flight of the medical personnel out from the conflict areas. We believe this exercise provides important clues for devising effective policies to counteract the negative impacts of civil conflicts on public health.

3. THE TURKISH CASE

Since late 1984, Turkey has been suffering from an insurgency campaign led by the Kurdish separatist guerrilla organization Kurdistan Workers' Party (Partiya Karkaren Kurdistan), the PKK. The organization was first founded with the goal of establishing an independent Kurdish state in southeastern Turkey, though later on in the 1990s, it appeared to have rolled back on its goal to a federational structure that would grant more autonomy to the large Kurdish minority in Turkey. Armed activities of the PKK have been almost completely concentrated in southeastern and eastern Turkey which is a poor, and underdeveloped part of the country, and which has traditionally been inhabited by ethnic Kurds. The attacks mostly targeted security forces and facilities in the area. Nevertheless, PKK insurgents also attacked schools and public offices, and public employees like teachers, clergymen, administrative officers, and also civilians whom they accused of "collaborating with the Turkish Republic".

Financially, the conflict has cost the country billions of dollars. But more importantly, it has cost more than 40 thousand lives (Şener, 2010). Our knowledge about civilian and insurgent casualties is limited to aggregate numbers sporadically released by contending sources as there is no credible and publicly available dataset on them. Nevertheless, Kıbrıs (2011; 2014a; 2014b) offers a unique database on security force (i.e., soldiers and police officers) casualties (SFCs).



As can be clearly seen in Chart 1 above which depicts the total number of SFCs over the years, the 90s has been the most bloody period of the conflict. There were clashes between the security forces and the insurgents almost everyday. Only in 1994, 1031 soldiers and 37 police officers were killed in the attacks. The PKK received a major blow when its leader Abdullah Öcalan was captured in Africa in 1999, brought back to Turkey, tried and sentenced to life in prison. Headless and divided, the PKK ceased its attacks in the early 2000s. Unfortunately, peace in the area did not last long. The PKK resumed its attacks in 2004. Interrupted by short lived cease-fires by the PKK the armed conflict between the Turkish security forces and the PKK continued for twenty-nine years up until the latest cease fire announced by the PKK in March 2013. The destructiveness of the conflict resulted in the deepening of the economic and social disparity between the conflict zone and the rest of the country. The area has lost its economic and social appeal for business and people, and has come to be considered as exile by public employees like doctors and teachers who are subject to periodical appointments by the state.

4. THE DATA

In this study we employ a novel database we constructed on the number of specialist and practitioner doctors, dentists, nurses, midwives, and health technicians across the 81 provinces[3] in

[3] Due to administrative changes the number of provinces went up from 67 to 81 over the years.

Turkey in the 1964-2010 period[4]. To construct this database we conducted a thorough study in the Turkish State Archives, analyzed and brought together numerous documents and publications by the Ministry of Health and several other health institutions in Turkey. We provide a detailed list of our source documents in the References section. Our database also includes the yearly percentage of births unattended by health personnel for the 1964-1981 and 1993-2005 periods, age-zero group BCG vaccination rates for the 1994-2006 period, and the yearly number of open medical doctor positions at public health institutions for the 2004-2012 period across provinces.

In order to measure the intensity of the conflict we refer to the casualty database by Kıbrıs (2011; 2014a; 2014b). This is a unique data set on Turkish military and police force casualties (security force casualties-SFCs) that the Kurdish insurgency claimed since the beginning of armed attacks in 1984. The data set includes the date, and place of death for a total of 6851 SFCs. The number of SFCs provide our measure of conflict intensity across localities. While the number of SFCs does not correspond to the total number of casualties, which is a commonly used measure of conflict intensity in the literature, we expect a high correlation between the two series. In fact, the yearly aggregates are 84% correlated with the yearly total casualties and 98% correlated with the yearly total number of PKK attacks reported by the Turkish General Staff (Şener, 2010). The correlation between the yearly total casualty numbers reported by the Federation of American Scientists (www.fas.org) and the yearly aggregates of SFCs in the database is even higher at 96%, while the correlation between SFCs and other casualties (civilians, insurgents and village guards) is 95%. These high correlations are not surprising considering the fact that attacks by the PKK, and offensive military operations by the Turkish security forces claim the lives of both combatants and civilians. Moreover, as the correlation between the number of SFCs and PKK attacks clearly demonstrate, SCFs in a county is a good measure of the PKK presence in the area. The presence of

[4] 2004 and 2005 are missing for specialist and practitioner doctors and dentists. Number of midwifes, nurses and health technicians are not available after 2003.

PKK insurgents and activity in an area cause a great deal of inconvenience for the civilian residents. Not only it means that they can get caught in crossfire or become a landmine or bomb victim, it also means that their daily lives are disturbed by the heightened security measures like the increased number of security personnel in the area, the frequent security checks and controls that are imposed on the civilians, and also by the frequent interruption of normal day-to-day life and the dampening of the economic and social life as a result of attacks and armed skirmishes between security forces and the PKK. In many cases it also means they can be pressured, threatened or even killed by militants searching for hide-outs, shelters, supplies or political support. Thus, we conclude that the number of SFCs provide a good measure of the level of conflict civilians are exposed to.

Finally, we derive the other socioeconomic indicators we include in our model from the Turkish Institute of Statistics. Table 1 below presents the descriptive statistics and the time span of the main variables we employ in our analyses.

TABLE 1: Descriptive Statistics					
Variable	**Time span**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Number of specialist doctors	1964-2010	341.15	1112	1	14437
Number of practitioners	1964-2010	306.45	766.97	5	9625
Number of dentists	1964-2010	133.64	440.4	1	5636
Number of nurses	1964-2003	477.13	989.59	4	10112
Number of midwives	1964-2003	309.34	370.12	4	3271
Number of health technicians	1964-2003	261.91	449.57	11	5377
Security force casualties in previous year	1964-2010	1.67	9.83	0	236
Population in ten thousands	1964-2010	73.55	104.29	0.51	1362.42
GDP per capita in constant prices	1975-2001	11408.98	6386.92	746.8	44889
Percentage of births unattended by medical personnel	1964-1981 1993-2005	18.24	17.53	0	100
BCG vaccination rates among new borns	1994-2006	75.82	20.89	2	100
Number of open MD positions at public health institutions	2004-2012	42.22	48.36	0	305

5. THE ANALYSES

5.1 Conflict and Availability of Medical Service Providers

In our first model, the dependent variable is the number of health practitioners across provinces, in other words, we are modelling count data. Consequently, we are going to estimate the

Table 2: Results of the negative binomial regressions on the number of medical professionals-Base model

Dependent variable: / Independent Variables	Number of specialist doctors	Number of specialist doctors	Number of practitioner doctors	Number of practitioner doctors	Number of dentists	Number of dentists	Number of nurses	Number of nurses	Number of midwives	Number of midwives	Number of health technicians	Number of health technicians
Number of SF casualties in previous year	0.992*** (-8.91)	0.997*** (-2.82)	0.996*** (-5.54)	0.998*** (-3.38)	0.995*** (-4.38)	0.998** (-1.97)	0.998*** (-2.62)	0.998*** (-2.78)	0.996*** (-5.94)	0.996*** (-5.88)	1.0003 (0.77)	1.0005 (1.07)
Population in ten thousands	0.999*** (-5.00)	0.999 (-1.61)	0.999*** (-5.92)	0.999 (-0.91)	1.0001 (1.77)	1.0007*** (5.02)	1.0004*** (6.31)	1.0006*** (8.10)	1.0006**** (9.21)	1.0008*** (9.25)	0.999** (-2.37)	0.999*** (-4.11)
GDP per capita in constant prices		1.000*** (5.50)		1.000 (1.51)		1.000*** (6.88)		1.000*** (10.18)		1.000*** (8.29)		0.999 (-0.53)
Province dummies	not reported, available upon request.											
Year dummies	not reported, available upon request.											
Number of observations	3175	1927	3177	1927	3171	1926	2693	1847	2693	1847	2692	1847

***: significant at 1% level; **: significant at 5% level. z-values in parenthesis parameters of the following fixed effects negative binomial regression model:

$$E(Y_{i,t}) = \lambda_{i,t} = \exp(\alpha + \beta_1 C_{i,t-1} + \beta_2 X_{i,t} + \beta_3 T + \beta_4 P + u_{i,t})$$

where Y_{it} is the number of medical professionals in province i in year t. We analyze the number of practitioner doctors, the number of specialist doctors, the number of dentists, the number of midwives, the number of nurses, and the number of health technicians respectively in the 1964-2010 period. $C_{i,t-1}$ is the number of security force casualties in province p in year (t-1); X_{it} is the population of province p in year t in ten thousands; T is a vector of year dummies controlling for time specific effects; P is a vector of province dummies controlling for province specific effects. Population numbers are the only available demographic control we have for the 1964-2010 period. It allows us to control for the demand for medical professionals, and also for the size of the locality. Nevertheless we were also able to collect data on GDP per capita in constant prices across provinces for the 1975-2001 period. We present below the results when we include this variable in the model as well. GDP per capita is a good indicator of economic conditions across provinces. Note that the inclusion of this variable restricts the time period of the analyses in accordance with data availability.

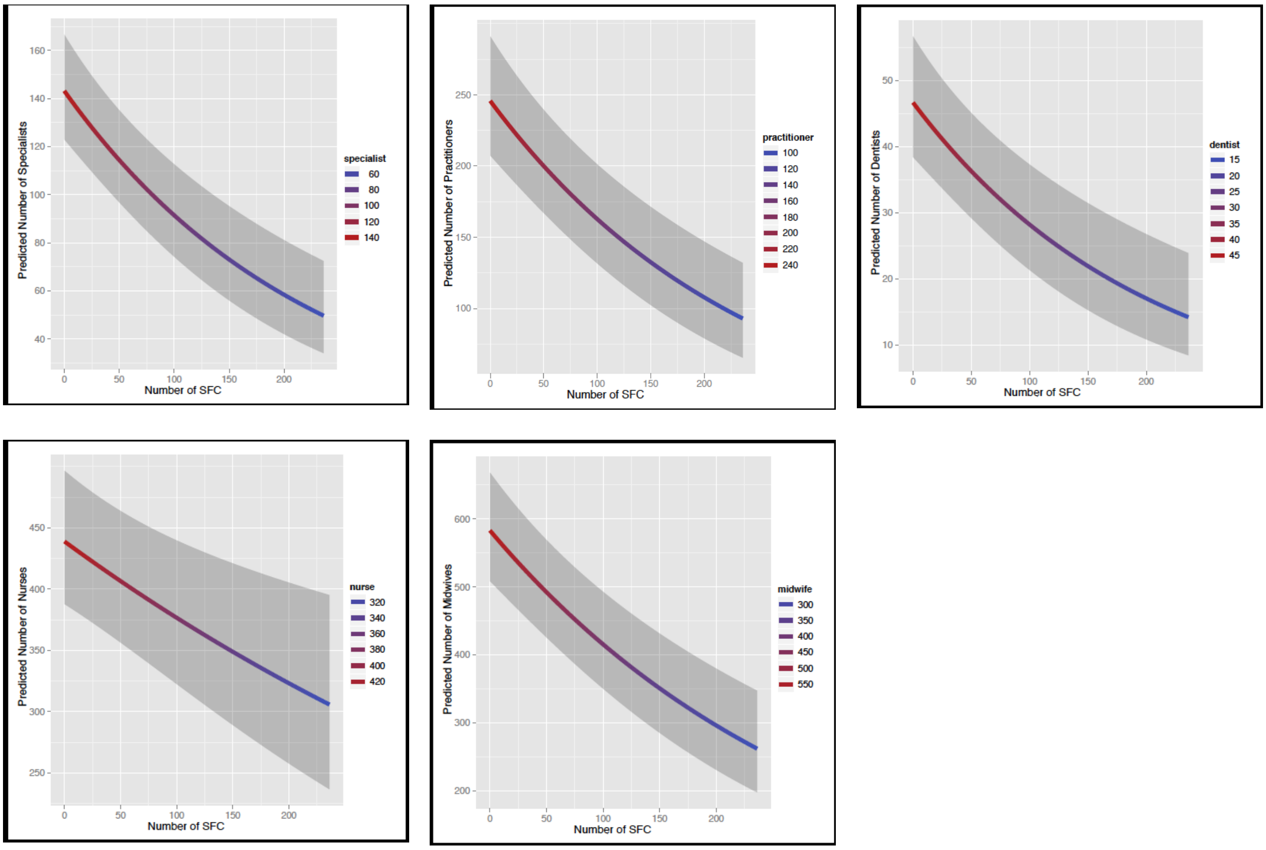
Table 2 below presents the results and Chart 2 visualizes them. For ease of reading we report the natural log of estimated parameters which corresponds to the *incidence rate ratio*. Correspondingly, the parameter for SFCs, for example, tells us that an additional SFC leads the number of expected specialist doctors to be multiplied by 0.992, in other words, leads to a 0.8%

decrease. The numbers in parenthesis are z-values. We do not report the estimated parameters for year and province fixed effects as there are too many of them to fit in a table[5].

[5] Results are available upon request.

As the results clearly reveal, except for health technicians, the conflict is significantly and negatively associated with the number of medical professionals across provinces. The insignificancy of the association for the number of health technicians is not surprising considering that health technicians are the least educated among the health practitioners we consider. It seems the conflict has been driving away the highly educated medical professionals from provinces where the clashes take place.

Chart 2: The predicted association between the number of health practitioners and security force casualties



A look at the distribution of SFCs over the years and provinces makes the magnitude of the impact more clear. In 1993, the average number of SFCs in provinces with positive casualties was 26, and there were 12 provinces with higher number of casualties. Based on the estimated coefficients, a province with 26 SFCs is expected to have 20% less specialist doctors, 10% less practitioners, 12% less dentists, 5% less nurses, and 10% less midwives in 1994 compared to similar size provinces away from the conflict zone. These declines correspond to 38% less specialists, 20% less practitioners, 25% less dentists, 11% less midwives in provinces with around 56 SFCs, which is only one standard deviation away from the mean number of casualties. Note that there were five provinces with a higher number of SFCs in 1993. Even more strikingly, in 1994, when the conflict peaked, the average number of SFCs in provinces with positive casualties was 35, and there were 9 provinces with a higher number of SFCs.

We also reestimated our model with the inclusion of the lagged dependent variable as a control[6]. In order not to take too much space we do not report the results here. Suffice it to say that the association between medical personnel availability and the conflict becomes even more substantial under this alternative model specification[7].

5.2 Availability of Medical Service Providers and Public Health

Clearly, the conflict has a negative association with the availability of medical professionals. And not surprisingly, the availability of medical professionals is an important determinant of public health (Lavy, Strauss, Thomas and De Vreyer, 1996). While this argument is quite self-evident, we, nonetheless, present some empirical evidence from the Turkish case on that front as well. To demonstrate the detrimental impact of the conflict on public health indicators and the role medical personnel play in this impact we estimate the following linear model using a Tobit regression analysis:

$$Z_{i,t} = \alpha + \beta_1 Y_{i,t} + \beta_2 C_{i,t-1} + \beta_3 X_{i,t} + \beta_4 T + \beta_5 P + u_{i,t}$$

where $Z_{i,t}$ will respectively be the percentage of births unattended by medical personnel, and BCG vaccination rates among new borns in province i, in year t. Y_{it} is the number of medical personnel in province i in year t. $C_{i,t-1}$ is the number of security force casualties in province p in year (t-1); X_{it}

[6] We are aware that the lagged dependent variable model suffers from "dynamic panel bias" (Nickell, 1981) which results from the correlation between the lagged dependent variable and the province fixed effects in the error term. Nevertheless, in our case dynamic panel bias does not create a problem since it only inflates the estimated parameter for the lagged dependent variable attributing it more predictive power than it really has. We are not interested in that estimate. We are interested in the estimate for the SFCs, which if anything is deflated downward because of this problem.

[7] Results are available upon request.

is the population of province p in year t in ten thousands; T is a vector of year dummies controlling for the time trend and other time specific effects; P is a vector of province dummies controlling for province specific effects. Similar to the first set of analyses, we estimate the model with the inclusion of GDP in constant prices across provinces as well. Table 3 below presents the results.

Table 3: Results of the Tobit regressions on public health indicators

Dependent variable: / Independent Variables	Percentage of births unattended by medical personnel	Percentage of births unattended by medical personnel	BCG vaccination rate among new borns+	BCG vaccination rate among new borns
Number of SFCs in previous year	0.112*** (7.08)	0.107*** (6.95)	-0.184*** (-7.15)	-0.236*** (-8.12)
Population in ten thousands	0.019*** (3.60)	0.012** (2.42)	-0.009 (-1.04)	-0.005 (0.55)
Number of midwives in the province	-0.01*** (-5.83)		0.01*** (2.87)	
Number of practitioners in the province		-0.003*** (-3.54)		0.004*** (2.66)
Year dummies	not reported, available upon request			
Province dummies	not reported, available upon request			
Number of observations	1262	1423	714	875

***: significant at 1% level; **: significant at 5% level; *:significant at 10% level. z-values in parenthesis.

+: In Turkey, vaccination of new borns are conducted by midwives. Similarly, most births, unless medical complications arise, are attended by midwives as well.

The estimated coefficients indicate that while the conflict is associated with a worsening in these indicators, the number of midwives and practitioners are associated with improvements. We get very similar results when we estimate a lagged dependent version of our model[8]. These results support our claim that the flight of medical personnel away from conflict areas is one important mechanism through which civil conflicts hurt public health in host societies.

6. CARROTS AND STICKS: PAY THEM MORE OR OBLIGE THEM TO WORK

[8] Results are available upon request.

Over the years Turkish governments tried out certain policies to intervene in the labor market for doctors to counteract the negative impact of the conflict on the availability of practitioner and specialists, and to ameliorate the disparity between the east and the west of the country. In 1988, a state of emergency was declared in 13 provinces in southeastern and eastern Turkey in response to increased PKK activity in these provinces. It was then decided that public servants in the state of emergency zone were to be paid around 30% more compared to their counterparts in other parts of the country (Official Gazette of the Republic of Turkey, 1988). This policy remained in place until 2002[9]. Another such interventionist policy is the mandatory service requirement for doctors that was in place between 1982 and 1994, and from 2006 onwards (Official Gazette of the Republic of Turkey, 1981, 2005). The policy requires doctors to serve for about two years in places to which they are appointed by the state. The appointment is done via a lottery mechanism. Every two months or so the Ministry of Health announces open positions for specialists and practitioners at public health institutions. Doctors who have just graduated or who have just completed their specialization are required to declare their preferences among these open positions. For those positions which are preferred by multiple doctors a lottery is held. Note that up until recent years, health sector in Turkey has been almost entirely public[10]. Consequently, the state has been the biggest, and in many places the only employer in the heath sector, and state policies about employment in the public health sector have almost completely determined the demand side of the labor market in medical professionals.

In this section we analyze whether any of these two policies has been successful in counteracting the dampening impact of the conflict on the number of doctors. We first modify our

[9] Some provinces were taken out of the state of emergency zone earlier in 1995.

[10] Private hospitals accounted for less than 2% of hospital beds across the country in 1980, 2.9% in 1990, 8% in 1999, and 15% in 2010.

original count model to include an additional pay policy dummy ($D_{i,t}$) that takes on the value 1 in those provinces and years the policy was in effect[11].

$$E(Y_{i,t}) = \lambda_{i,t} = \exp(\alpha + \beta_1 C_{i,t-1} + \beta_2 X_{i,t} + \beta_3 D_{i,t} + \beta_4 T + \beta_5 P + u_{i,t})$$

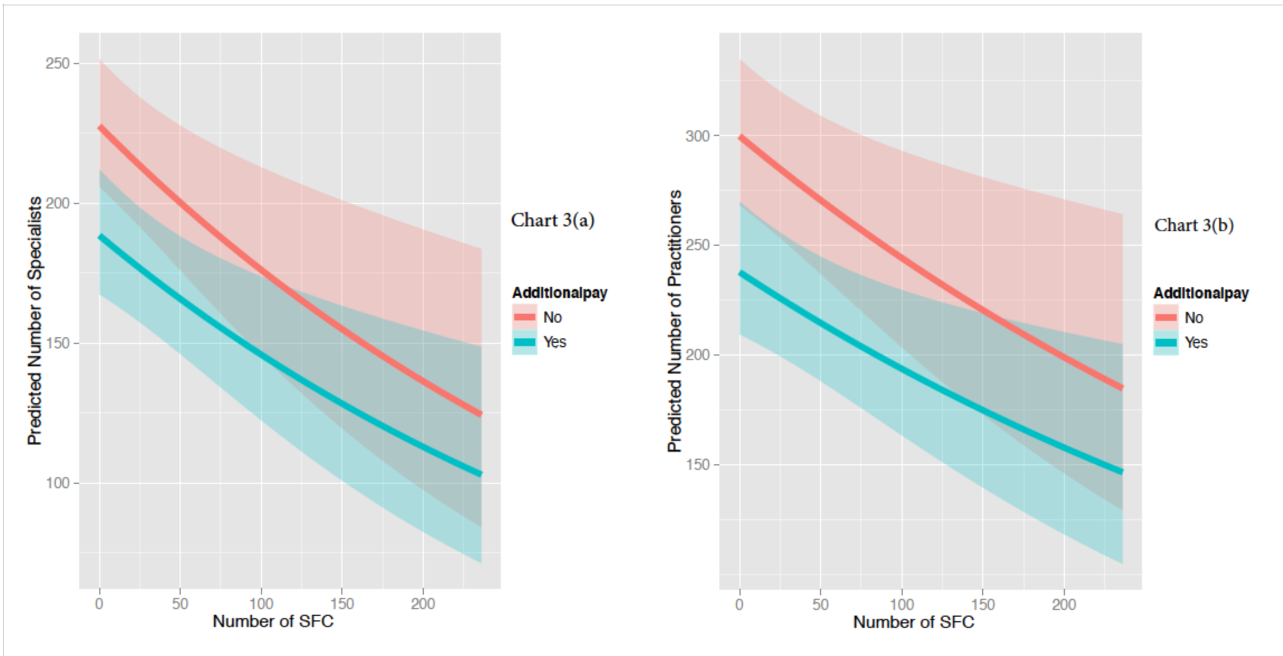
Table 4 below presents the results, and Charts 3(a) and 3(b) visualize them.

Table 4: Results of the negative binomial regressions on the number of medical personnel

Dependent variable: / Independent Variables	Number of specialist doctors	Number of dentists	Number of practitioner doctors	Number of midwifes	Number nurses	Number of health technicians
Number of SF casualties in previous year	0.997*** (-3.60)	0.997** (-2.33)	0.998** (-1.89)	0.997*** (-4.71)	0.999* (-1.86)	1.0002 (0.53)
Population in ten thousands	0.999*** (-5.42)	1.0002* (1.76)	0.999*** (-6.24)	1.0007*** (9.10)	1.0004*** (6.24)	0.999** (2.34)
Additional pay policy dummy	0.658*** (-12.42)	0.819** (-4.47)	0.774*** (-9.32)	0.943** (-2.19)	0.96* (-1.73)	1.015 (0.56)
Year dummies	not reported, available upon request					
Province dummies	not reported, available upon request					
Number of observations	3175	3171	3177	2693	2693	2692

***: significant at 1% level; **: significant at 5% level
The estimated coefficients are incidence rate ratios. z-values in parentheses.

[11] We cannot include an interaction variable between casualties and additional pay policy dummy as it leads to severe multicollinearity. Because the additional pay policy was in effect in provinces that were under the state of emergency, and because state of emergency was declared in provinces where the fighting took place, the interaction variable turns out to be 96% correlated with the SFC series. In other words we cannot estimate the differential impact of the policy on the negative association between the conflict and doctor counts.



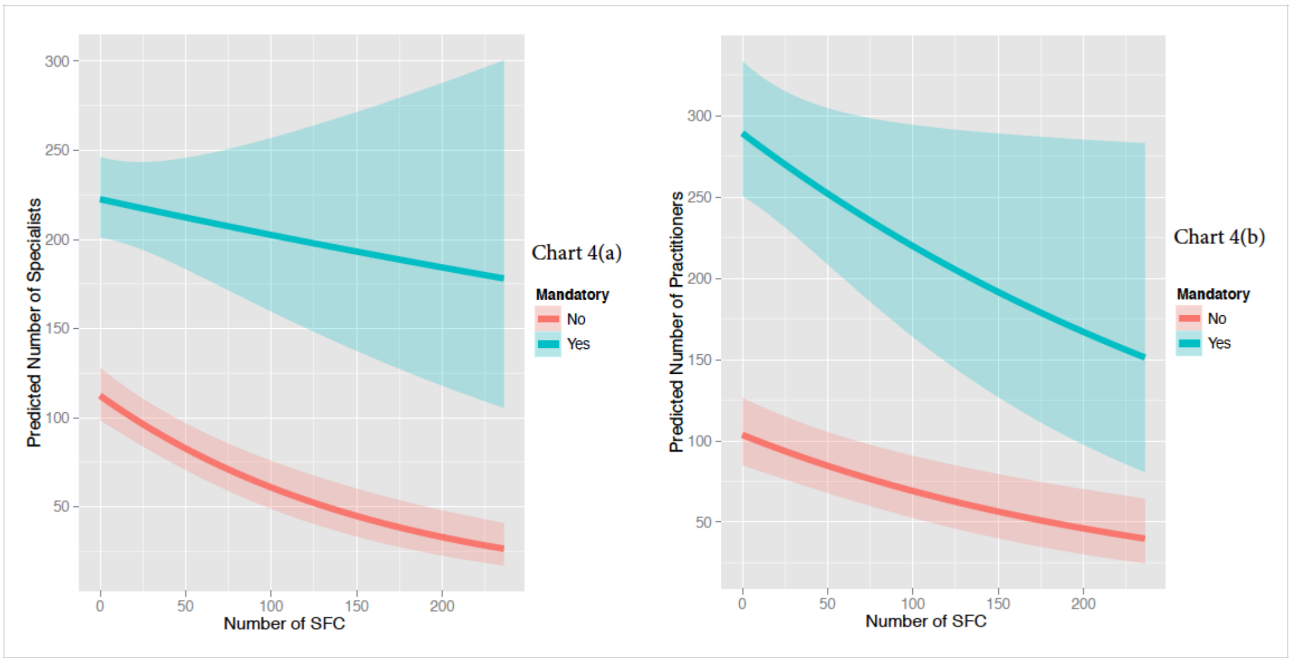
Interestingly, the results indicate a significant drop in numbers in places where the additional pay policy was in effect. This drop is most probably due to the fact that the additional pay policy was employed in provinces under the state of emergency, and that the state of emergency was declared when and where the armed conflict was really intense. In other words, it is likely that the policy dummy is capturing the impact of the high intensity of the armed conflict in those places. Unfortunately we can only observe the net impact of the additional pay policy and high conflict intensity together as the geographical and temporal overlap disables us from separating one from the other.

Next, we assess the effectiveness of the mandatory service requirement policy. Similar to the previous analysis, we introduce to our original model a mandatory service requirement dummy that takes on the value 1 for those years that the policy was in effect, and an interaction variable between casualties and this policy dummy. In other words, we estimate the following count model:

$$E(Y_{i,t}) = \lambda_{i,t} = \exp(\alpha + \beta_1 C_{i,t-1} + \beta_2 X_{i,t} + \beta_3 D_{i,t} + \beta_4 D_{i,t} * C_{i,t-1} + \beta_5 T + \beta_6 P + u_{i,t})$$

Below, table 5 presents the results and Charts 4(a) and 4(b) visualize them.

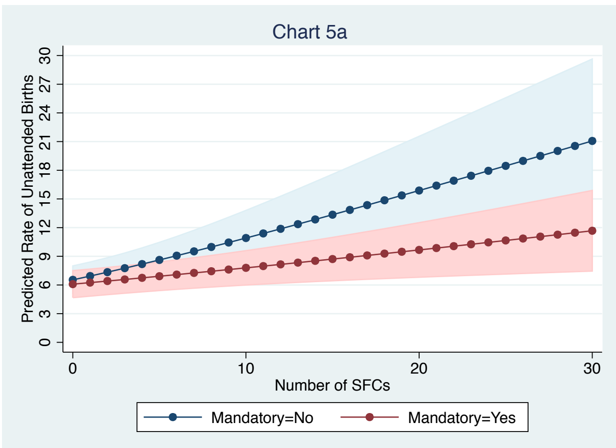
Table 5: Results of the negative binomial regressions on the number of doctors		
Dependent variable: / Independent Variables	Number of specialist doctors	Number of practitioner doctors
Number of SF casualties in previous year	0.989*** (-9.05)	0.996** (-5.64)
Population in ten thousands	0.999*** (-5.06)	0.999*** (-5.91)
Mandatory service policy dummy	2.66*** (13.60)	2.75*** (12.40)
Interaction between mandatory service and casualties	1.006*** (4.94)	1.002* (1.86)
Year dummies	not reported, available upon request	
Province dummies	not reported, available upon request	
Number of observations	3175	3177
***: significant at 1% level; **: significant at 5% level The estimated coefficients are incidence rate ratios. z-values in parentheses.		

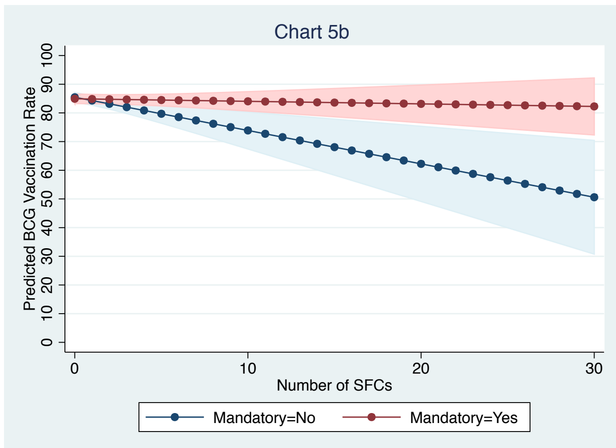


It is quite clear that the mandatory service requirement gives a significant boost to the number of doctors. Next we explore whether that boost brings about an improvement in public health in conflict areas. To do that we focus our attention to the 2005-2006 period when the mandatory service requirement policy was reintroduced, and reestimate our Tobit regression model of public health indicators with province level random effects[12]. We include to our model a policy dummy that takes on the value 0 for year 2005 when there was no mandatory service requirement policy in place, and 1 for year 2006 when the policy change takes place. We also include an interaction variable between the policy dummy and the one-year lagged security force casualties to examine whether the policy change impacts upon the extent the conflict damages public health. Table 6 below demonstrates how the mandatory service requirement policy counteracts the damage the conflict inflicts upon the percentage of births unattended by medical personnel and BCG vaccination rates among new borns in conflict areas when it comes into effect in 2006. While each additional SFC is associated with a 0.52 point increase in the percentage of births unattended by medical personnel, with the introduction of the mandatory service requirement policy that increase goes down to 0.22 points. Similarly, while each additional SFC is associated with a 1.16 points decrease in the BCG vaccination rates among new borns, with the introduction of the mandatory service requirement policy the damage goes down to 0.09 points. Charts 5a and 5b visualize these results.

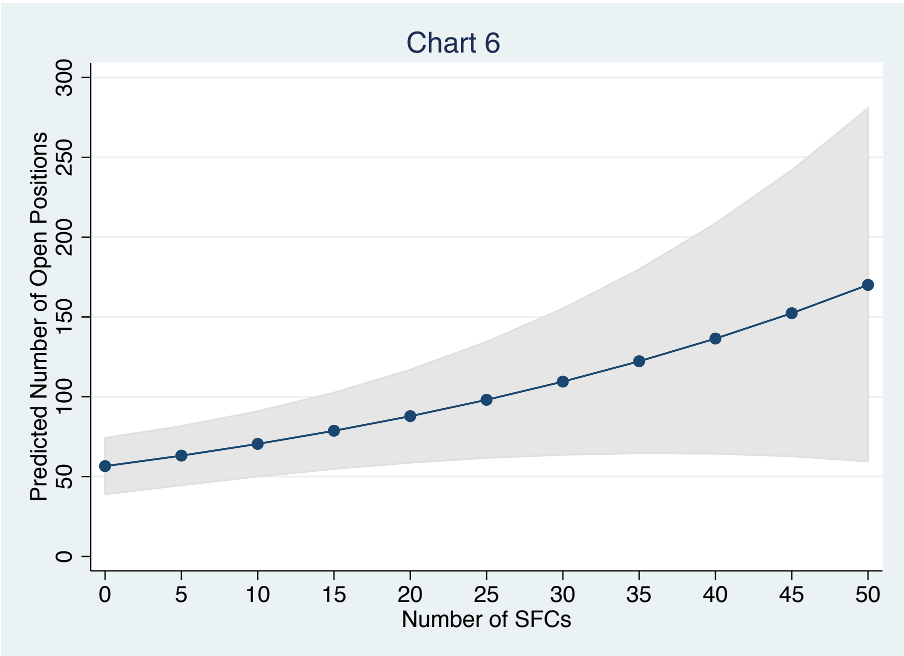
[12] Note that we do not have data on public health indicators prior to 1994 and after 2006. Consequently, we are not able to study the impact of the mandatory service requirement policy on public health when the policy was first tried out in the 1982-1994 period. So, in this analysis we focus our attention to the 2005-2006 period and thus, work with a much smaller sample size. That is why we account for province level unobserved factors with random effects rather than fixed ones which consume too many degrees of freedom. Nevertheless, the results from the fixed effect specification are very similar and are available upon request.

Table 6: Results of the random effects Tobit regressions on public health indicators		
Dependent variable: / **Independent Variables**	**Percentage of births unattended by medical personnel**	**BCG vaccination rate among new borns**
Number of SFCs in previous year	0.524*** (3.57)	-1.16*** (-3.38)
Population in ten thousands	-0.005 (-0.88)	0.013** (2.37)
Mandatory service policy dummy	-0.615*** (-3.47)	-0.52 (-0.63)
Interaction between mandatory service policy dummy and the number of SFCs in previous year	-0.301*** (-3.39)	1.07*** (3.58)
Standard error for province level random effects	0.654	0.656
Number of observations: 162 Number of groups: 81 Observations per group: 2		
***: significant at 1% level; **: significant at 5% level; *:significant at 10% level. z-values in parenthesis.		





Further evidence of the dampening impact of the conflict on medical personnel availability and the effectiveness of the mandatory service requirement as a counteractive policy comes from a closer look at the open position announcements. Since 2004, the Turkish Ministry of Health has been posting on its website the open positions for doctors in public health institutions all over the country. Employing these listings we first estimate a negative binomial random effects model to analyze the association between the yearly number of open positions and the conflict intensity across provinces over the 2007-2012 period[13]. We control for per capita number of practitioners in the previous year to account for the demand for doctors in the province; the number of one-year-lagged SFCs to account for recent episodes of violence; and the total amount of bank deposits to account for economic development. We also include a dummy for emergency zone status to differentiate those provinces that were at the heart of the conflict during the 80s and the 90s, that is, to account for high levels of violence in the past. Note that we control for other province level unobservables with the random effects setup[14]. The results are presented in Table 7 and visualised in Chart 6 below. As can be seen, compared to other provinces, each year a significantly higher number of open positions are announced in provinces in the emergency zone and in provinces with recent casualties, indicating a constant shortage of doctors in these places.



[13] The time period is dictated by data availability for control variables.

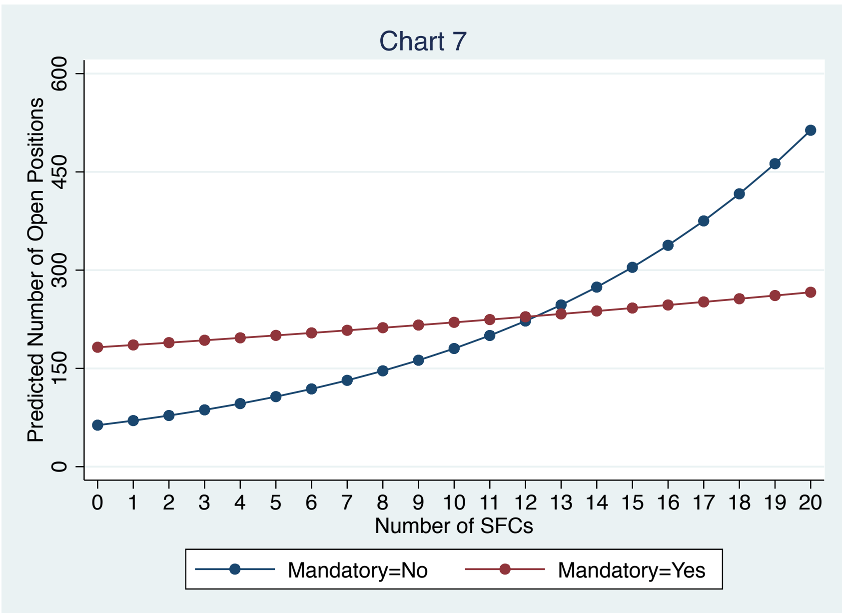
[14] We cannot run a fixed effects model once we include the emergency zone dummy since it becomes perfectly collinear with province dummies. Nevertheless, we obtain similar results when we drop the emergency zone dummy and run a negative binomial model with province fixed effects. Results are available upon request.

Table 7: Results of the random effects negative binomial regression on the number of open positions		
Dependent variable:	**Yearly total number of open positions at the province level**	
Independent Variables		
Number of SF casualties in previous year	1.022*** (3.08)	
Number of practitioners per ten thousand inhabitants in previous year	0.999 (-0.75)	
Emergency zone dummy	1.423** (2.33)	
Bank deposits	0.999 (-1.20)	
Standard error for province level random effects	1.453	
Number of observations: 480	Number of groups: 80	Observations per group: 6
***: significant at 1% level; **: significant at 5% level. The estimated coefficients are incidence rate ratios. z-values in parentheses.		

Note that if conflict drives away medical personnel, and if the mandatory service requirement is effective in counteracting this flight, then, with the reinstatement of the policy in 2006, we should see a decrease in the number of open positions especially in conflictual provinces. Table 8 below presents the results of the random effects negative binomial regression we run on the number of open positions across provinces in 2005 and 2006. We control for one-year lagged SFCs to account for recent episodes of violence, population to account for demand for medical services, bank deposits to account for economic conditions, and emergency zone status to account for high levels of past violence. We also include a mandatory service requirement dummy to account for the policy change from 2005 to 2006. Finally, we include an interaction variable between the policy dummy and our casualty variable to investigate whether the policy change impacts upon the association between the conflict and the number of open positions.

Table 8: Results of the random effects negative binomial regression on the number of open positions	
Dependent variable:	**Yearly total number of open positions at the province level**
Independent Variables	
Number of SF casualties in previous year	1.11** (2.28)
Population in ten thousands	1.006 (1.40)
Bank deposits	0.99 (-1.56)
Emergency zone status	4.64*** (4.21)
Mandatory service policy dummy	2.88*** (6.40)
Interaction between mandatory service policy dummy and the number of SFCs in previous year	0.918*** (-2.61)
Standard error for province level random effects	0.547
Number of observations: 160 Number of groups: 80	Observations per group: 2
***: significant at 1% level; **: significant at 5% level. The estimated coefficients are incidence rate ratios. z-values in parentheses.	

Chart 7 below visualizes these results which provide further evidence of the effectiveness of the mandatory service requirement as a counteractive policy. Clearly, the number of open positions are positively associated with recent episodes of violence but the reinstatement of the mandatory service requirement policy in 2006 dampens that association especially in high conflict areas.



7. CONCLUSION

This study approaches the negative association between civil conflicts and public health from a labor market perspective, and demonstrates how the long running civil conflict in Turkey has been damaging public health by driving away doctors and other highly trained medical personnel from conflict areas. By doing so, it draws attention to this important, yet never analyzed before mechanism through which civil conflicts exert their long-term negative influences on the most important "life chance" of societies (Boop and Ford, 2010), namely, the chance to lead a healthy life. We then assess the effectiveness of certain policy measures that Turkish governments have tried out over the years to intervene in the medical labor market to offset the disparity between the conflict zone and other parts of the country in terms of the availability of health practitioners.

Recent studies have been bringing to light the many different ways civil conflicts hurt societal well-being. Not surprisingly public health is one of the most important of those ways. While recent works clearly reveal the damaging impact of conflicts on various dimensions of public health, we still need a better understanding in terms of the mechanisms through which such detrimental effects occur. Such an understanding is crucial for developing effective policy measures to counteract the damage. Our study contributes to the literature by providing the first empirical study and evidence of an important dynamic, namely the flight of highly trained medical personnel from conflict areas. Our contribution extends to policy development as well. We believe our results on the effectiveness of the two medical labor market policies tried out by Turkish governments provide important lessons for policy makers in similar situations. This first policy amounted to paying about 30% more to doctors who serve in the state of emergency zone. It turns out 30% more was not enough to persuade doctors to stay in places with high levels of violence. An interesting question is how high the government should have gone to do so, and whether such payments would have been feasible. The second policy that we analyzed is the mandatory service requirement which is still in place today in Turkey for doctors. Interestingly, that policy seems to be much more effective in giving a boost to the number of doctors available in provinces within the conflict zone and thus, in counteracting the damage on public health. Nevertheless, our results indicate that the mandatory service requirement also fails to fully compensate for the negative association between the conflict level and doctor availability. It seems neither carrots nor sticks yield stellar results on their own. An alternative worth considering might be mixing them. For example, rather than requiring all doctors to complete a-two year mandatory service regardless of the location of the appointment, different weights can be assigned to days in service based on the level of violence in the locality, thereby allowing doctors who agree to serve in high conflict areas to be done with their mandatory service requirements in shorter periods of time.

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