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#### **Labour migration and its impact on the labour market**

### **Challenges in estimating irregular migration in Israel since 1995<sup>1</sup>**

**Note by CBS, Demography Division, Israel\***

#### *Abstract*

This paper describes the ongoing methods used and challenges faced by Israel's Israel Central Bureau of Statistics (ICBS) in constructing an estimate of Israel's illegal foreign population. Since 1995, the estimate has been based on statistical interpretations of data from the Border Control Register (BCR) administrative system. During the past 20 years, there were several changes in the Border Control system which necessitated updating and reevaluating the methods used for estimation of foreigners in general and illegal foreigners in particular. In addition to the changes in the BCR system, the ICBS faced structural changes within the government ministries in charge of managing foreigners' data, changes in immigration policy, etc.

Estimates for foreign workers have been calculated at the ICBS since 1995. From 1995 to 1999, the estimate of illegal workers was based on computing the number of tourist visa overstayers from less developed countries in each year, while taking into account the possibility of mismatched records of entry and exit movements across borders within the Border Control system (using a statistical model for calculating this system error).

Since 2000, the method of constructing the estimates was modified due to changes in the way the data was managed at Border Control system. From 2008, some attempts were made to update the method of constructing the estimates. Past experience, the advantages and disadvantages of the various methods and the possible outcomes of each are discussed.

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<sup>1</sup> This paper is sequel for the WP No 13 of Joint ECE-EUROSTAT Work Session on Migration Statistics, Geneva 2001

## I. Foreign workers: the background

1. Israel did not attract international labour migrants until the 1990s. When they were first permitted to arrive in significant numbers in the mid-1990s, they were meant to replace Palestinians from the territories of the West Bank and Gaza Strip whose presence was perceived as a security threat. The number of foreign residents entering Israel with work permits increased from 20,000 entries per year in 1991 to 91,000 entries per year in 1996. Since then, as a result of a compromise that was reached between the Israeli government and representatives of employers' bodies, the number has decreased, fluctuating between 30,000 and 50,000 entries per year. The border control file is a major resource used by the Ministry of Interior<sup>2</sup> for registration of foreign workers and other types of foreigners. Since its inception, the border control file has been a major statistical resource for the Israel Central Bureau of Statistics (ICBS). Until the end of 1999, the ICBS received monthly extracts of flows (entries and exits) for all types of foreigners. Additionally, at the end of each year, extracts containing data on all types of foreigners staying in Israel at the end of the year (stocks) were received.

2. However, at the beginning of 2000, faced with an increasing backlog, the Ministry of Interior halted the key-punching of all border cards, intending to replace this with an optical data entry system. However, to date, the border control file has not been updated. As a result, the ICBS has received files of flows and stocks exclusively for foreign workers, who were updated in the new system, and not for other types of foreigners.

3. Systematic error in the registration of matching exits is often observed in countries with a computerized system of registration for flows. Since the registration process on departure is based on matching data on the exit of a foreigner with his or her data on entry, any failure to match these data (due to error in recording the identity or serial number of a foreigner either at entry or on departure) results in the creation of an exit unrelated to a previous entry, while the original entry remains "open". Repeated mistakes inflate the stock of foreigners, reflecting not the true number but system error.

4. Given the attention devoted to the number of foreign workers, there is reason to believe that the registration process is more precise for workers than for other types of foreigners, upon both entry and exit.

5. Along with the entry of foreign workers on work visas, illegal immigration of tourists from developing countries for the purpose of working began. Within a few years, the number of illegal workers reached, and even passed, the number of legal workers. This phenomenon greatly impacted the Israeli economy. Over the years, various estimates of the number of illegal foreign workers have been

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<sup>2</sup> From July 2008, The **Administration of Border Crossings, Population and Immigration** (PIBA) is responsible for administering population registries (including identification cards and passports), the granting of citizenship, approval and supervision of entry and exit, inspection and licensing of firearms, and the treatment of foreigners staying in Israel, including Palestinian workers, illegal aliens, migrant workers and refugees.

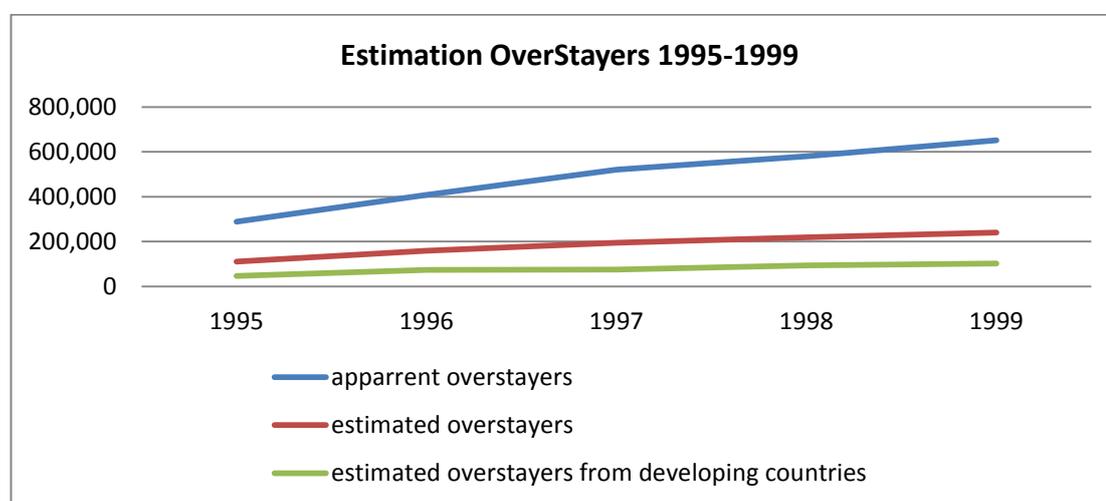
publicized in the media. Therefore, the official estimates for Israel built by the ICBS are of great importance.

## II. Estimations of Illegal workers - overstayers

### A. Method 1995-1999, based on system error

6. Since 1995, the ICBS has prepared special estimates of the number of illegal workers. The estimates are calculated on the assumption that most of the tourist visa overstayers from the less developed countries can be considered to be illegal workers. However, an extract of the stock of tourist visa overstayers could not be obtained directly from the border control file, because mismatched records of entry and exit inflate the apparent stock of visa overstayers. The ICBS used a method that was developed at the Immigration and Naturalization Service of the USA by Robert Warren and adjusted to the Israeli migration context by Ari Paltiel. The method estimates an overall system error by calculating the percentage of apparent overstays for each country as the ratio of apparent overstays to tourist arrivals (subtracting those who changed their status). On this basis, the system error is estimated as the weighted average of the rates for the countries with the lowest rates of apparent overstay. The same countries tended to participate in this group for each year: Japan, Denmark, Switzerland, Germany, Sweden, Finland, Hong Kong, Indonesia, and Singapore. The estimates of overstays by country of residence are finally derived by subtracting the overall system error from the number of apparent overstays<sup>3</sup>.

**Graph 1**



7. Each year, a new calculation is made based on an annual file of the stock of visa overstayers in Israel, unconnected to the stock files from the previous years.

<sup>3</sup> <https://www.unece.org/fileadmin/DAM/stats/documents/2001/05/migration/13.e.pdf>, prepared by Laura Staetsky

The estimate is built based on an aggregate calculation, such that records cannot be updated on an individual level. This leads to most of the drawbacks of the system.

*The drawbacks of this system are as follows:*

8. Status changes in Israel cannot be updated. That is, updates are not obtained for foreigners who become citizens. As a result, these records remain in the estimate of illegal foreign workers. This is especially important for persons who came from Eastern European countries (the former Soviet Union, Romania, the Czech Republic, etc.), where there is a Jewish population. These Jews are entitled to become citizens of Israel under the Law of Return. In addition to naturalizing, a tourist can obtain a work visa, die, or cross a land border such as to Jordan. In addition, there is no way of knowing a person's demographic data, such as age and gender.

## **B. Method for 2000-2009, based on "balance per country"**

9. As indicated above, since 2000, the Ministry of the Interior has not key-punched border cards for foreign workers.

10. Therefore, since 2000, data on foreigners crossing the border have been obtained by the ICBS from police files. The data in these files do not distinguish between the different types of visas of those entering and exiting the border, because they are obtained from the police without screening or linking to files of the Ministry of the Interior, as was done up to 2000. This has many consequences: These files include not only tourists, but also anyone who crosses the border on a foreign passport, including diplomats, students, clergy, etc.

11. As a result of changes in the source of the data, a new method was developed (by Laura Staetsky) that is based only on exit and entry balances, by citizenship, from the developed countries.

12. The estimate takes into account that persons entering during October-December in the entry file are still considered tourists (a tourist visa is for up to three months), and cannot be included at the end of the year as overstayers.

13. The last estimate for 1999, which was calculated using the "estimate of system error" method, served as a base for the 2000 estimate ( $P_{i,t-1}$ ).

14. The estimate for year  $t$  was calculated for every country separately, using the following formula:

$$P_{i,t} = P_{i,t-1} + IN_{i,t}^{1-9} - OUT_{i,t}^{1-9} + NB_{i,t}^{10-12} + PB_{i,t-1}^{10-12} - F_{i,t}$$

Where:

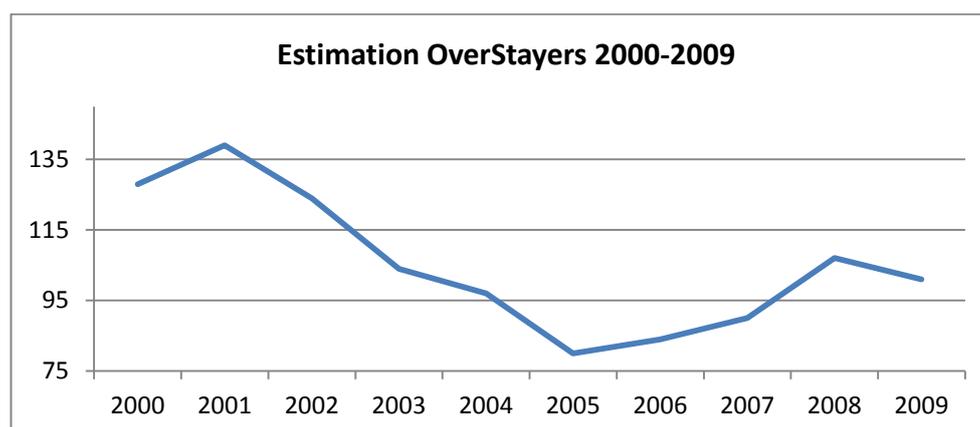
- $IN_{i,t}^{1-9}$  —Entrances in year  $t$ , by citizenship (Jan.–Sept.)
- $OUT_{i,t}^{1-9}$  —Exits in year  $t$ , by citizenship (Jan.–Sept.)
- $NB_{i,t}^{10-12}$  —Negative balance of months Oct.–Dec. in year  $t$ , by citizenship
- $PB_{i,t-1}^{10-12}$  —Positive balance of months Oct.–Dec. in year  $t - 1$ , by citizenship

- $F_{i,t}$ —Estimates of foreign workers with work visas, immigrants, tourists who changed their status to immigrants, by citizenship in year t
- IN — inflows  
 OUT — outflows  
 i — country of citizenship  
 t — year  
 1–9 (January to September), 10–12 (October to December) — months of entrances/exits  
 $F_{i,t}$  — estimates of workers, immigrants, etc.

*The drawbacks of the estimate:*

15. The problems of the estimate until 1999 continue to exist in this estimate. In addition, in this estimate, unlike the previous one, the length of stay of a foreigner in Israel cannot be calculated. Countries that were not in the estimate in 1999 are not included in the calculation at all.

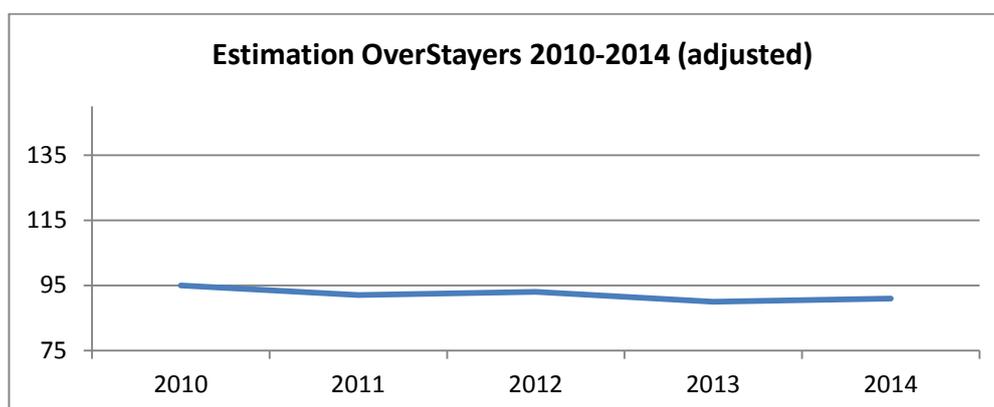
**Graph 2**



### **C. Method for 2010-2014, based on adjusted "balance per country"**

16. A new system for border registration, known as "Rotem", was launched in 2008. The new system replaced the existing system of the border police. Under the Rotem system, the data quality improved, data could be produced by visa, and linkage between foreign passport and Israeli identity card improved. Therefore, as of 2009, entrance and exit balances were calculated from this system.

Graph 3



17. Although the data source improved, the estimates retained the errors from previous years. Therefore, there was a need to change the calculation method. Recent experiments with new sources of data.

#### **D. Recent experiments with new data sources**

##### **1. File of deported foreigners, 2015**

18. We obtained an additional file of exits: captures by the immigration authorities.

19. Analysis of the file showed that 85% of those captured had stayed in Israel up to 5 years, another 12% had stayed in Israel between 5 and 10 years, and only 3% had managed to stay in Israel over 10 years.

##### **2. Linking the Population Register with the stock of foreigners apparently in Israel from 1995– 2014**

20. Israel's Naturalization Law allows family reunification: A person with foreign citizenship can naturalize if he or she is married to an Israeli citizen. In addition, persons entitled to citizenship under the Law of Return can come to Israel as tourists or on any other visa and become Israeli citizens. The ICBS's Demography Sector receives data on naturalization each year. However, as mentioned above, it is problematic that there is no link in the stock of foreigners between a foreign passport and an Israeli ID card. This causes these persons to remain in the stock file forever. It was decided to link between the Population Register and the stock of foreigners according to names in Latin letters, country of citizenship, and exact date of birth, in order to estimate the number of persons naturalized by country. The stock included 2,466,000 records and the Population Register included 11,064,000 records.

21. The results showed that approximately 143,000 records were linked, 6% of the records in the stock. The table shows the distribution of selected countries (with the highest representation):

Table 1

	Thousands	Percents
<i>USA</i>	28.0	19.6
<i>Russia</i>	17.5	12.2
<i>Ukraine</i>	17.0	12.0
<i>France</i>	12.2	8.5
<i>Argentina</i>	7.2	5.1
<i>Israel</i>	7.0	4.9
<i>UK</i>	5.7	4.0
<i>Uzbekistan</i>	3.2	2.3
<i>Canada</i>	3.0	2.1
<i>Belarus</i>	2.7	1.9
<i>Georgia</i>	2.4	1.7
<i>Romania</i>	2.2	1.5
<i>S. Africa</i>	2.0	1.4
<i>Philippines</i>	1.4	1.0
<i>Others</i>	31.4	21.8
<b>Total</b>	<b>142.9</b>	<b>100.0</b>

22. The table shows that most of the countries listed, from which links were made to the stock, are developed countries or countries of the former Soviet Union. It can be concluded that tourists from developing countries in the Far East and Africa do not naturalize in Israel. It is also possible that the result is erroneous because of the difficulty of linking names from the Far East countries.

### 3. Analysis of the "Reverse Stock" file

23. As mentioned above, data received by the ICBS from administrative sources include data from the border control system on flows and stock for the end of each year. This stock includes all foreign citizens who entered Israel from 1990 for whom no exit was recorded. Exits go unrecorded for various reasons. First, the person could actually be an illegal stayer. Second, there could be a failure in linking the entry record to the exit record. Third, the person could have naturalized. As of the end of 2014, the stock file included approximately 2,000,000 records. Because this number is illogical, and it is clear that most of these persons left the country, the question arose as to what happened to the exit records that were not linked to entry records due to data entry errors, optical scanning errors, etc. Discussion of this issue with the Ministry of the Interior revealed that the exit records that are not linked are not saved in the border control system. Rather, they are moved to a separate file, a sort of "trash can" of the system. In 2011, we succeeded in obtaining this "Reverse Stock" file, with the intent of attempting to link it to the stock of foreigners. We hoped to thus obtain the actual number of persons staying in Israel.

24. In actuality, we did not succeed in linking these two files to a sufficiently high degree. What we were able to obtain from the file was the percentage of exit records that were not received by the ICBS each year.

25. The figures and tables below show that during 2007–2010, the percentage of exits that were not linked to entries decreased steadily, in particular since the

introduction of the Rotem system in 2008: In 2010, the steep drop in this percentage is apparent. In other words, in the new system, the linkage of records improved significantly. It can also be concluded that the linkage of records for the developing countries (especially the Asian countries) is less successful. For example, in 2007, almost four times as many exits of persons from Thailand were not linked to entries as exits that were linked. In the following years, this percentage decreased, but even in 2010, nearly 97% of the exits were not linked. A similar situation, but of lesser proportions, was observed for exits of persons from the Philippines: In 2007, 29% of the exits were not linked, but in 2010, this percentage was only 13%.

26. The situation was different regarding developed countries. For Japan, in 2007, 3.4% of the exits were not linked to entries, as compared to 2.2% in 2010. The percentages were similar for the United States: In 2007, 2.8% of the exits were not linked, and in 2010, only 1.6% were not linked.

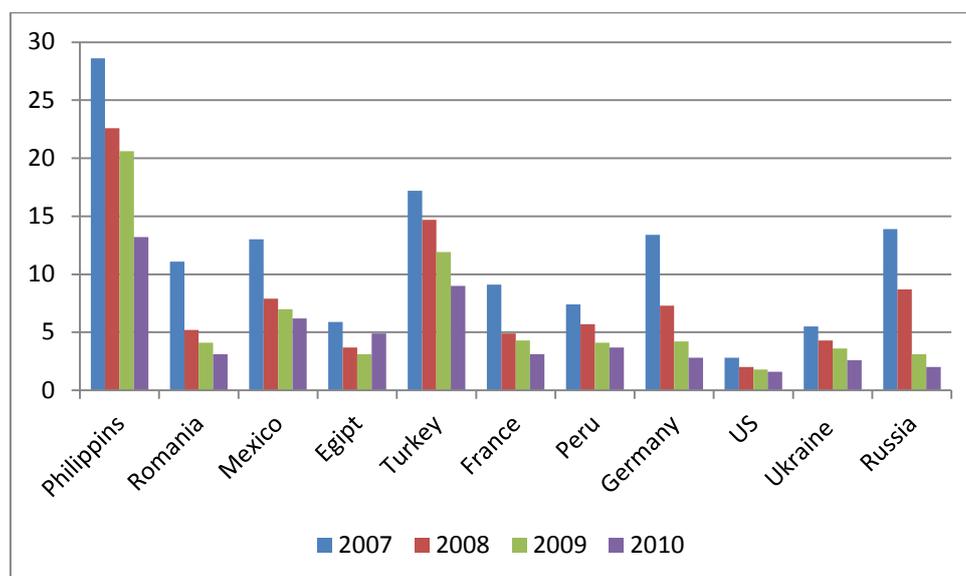
**Table 2:**

Percent of non-registered departures of foreigners

	2007	2008	2009	2010
Philippines	28.6	22.6	20.6	13.2
Romania	11.1	5.2	4.1	3.1
Mexico	13	7.9	7	6.2
Egypt	5.9	3.7	3.1	4.9
Turkey	17.2	14.7	11.9	9
France	9.1	4.9	4.3	3.1
Peru	7.4	5.7	4.1	3.7
Germany	13.4	7.3	4.2	2.8
US	2.8	2	1.8	1.6
Ukraine	5.5	4.3	3.6	2.6
Russia	13.9	8.7	3.1	2.0
China	67.7	49.4	28.6	21.3
Thailand	409.4	172.5	122.3	97.1
Nepal	896.8	316	196.4	42.6

**Graph 4:**

Percent of non-registered departures of foreigners by year



### E. Experience in updating methodology – Survival-based method

27. Based on all of the examinations described in the previous section, it was thought worthwhile to examine the "remainders", i.e., persons staying in Israel, by months and years of staying.

28. The method was based on the assumption that as long as exits of tourists who entered in early years are recorded, there is proof that there exists a population who survives in Israel over several years (the difference between entry year and exit year).

29. It was decided to examine the survival of entries during the years 1995–2014. In the first stage, linkages were formed for the files from the past eight years (2007–2014).

30. The structure of the tourist files allowed us to obtain information at the individual level such as passport number, name, year of birth, gender, date of entry, and date of exit. However, linking by passport number and name was not successful because there were entries without exits and exits without entries. Therefore, it was decided to use country of citizenship, year of entry, month of entry, year of exit, and month of exit.

31. A table was created for each country (see Appendix A).

32. The pattern of exits was examined for each country. Typically, approximately 80–90% of persons entering who are from developed countries leave within a month. The remainders of the visitors continue to leave in smaller numbers. Usually, within a year, approximately 0.5–2% of the visitors remain. The numbers are much larger for the developing countries. Approximately 60% leave within a month, and after a year, approximately 3–5% remain. Apparently, persons who changed their status and legal foreign workers were removed from the "remainders" file.

33. It is possible that the high survival percentages in the file of entries from countries such as China and Thailand are due to difficulties in linking the records according to passport number or name spelled in Latin letters.

34. The low survival percentages for the developed countries indicate that the assumption of system error, as in the US (Warren's) method of calculation, is correct.

35. The advantages of this method are the calculation of time stayed in Israel and the ability to manage a database from year to year.

**Table 3:**

Entries and Overstays from Philippines, by year 2007-2014

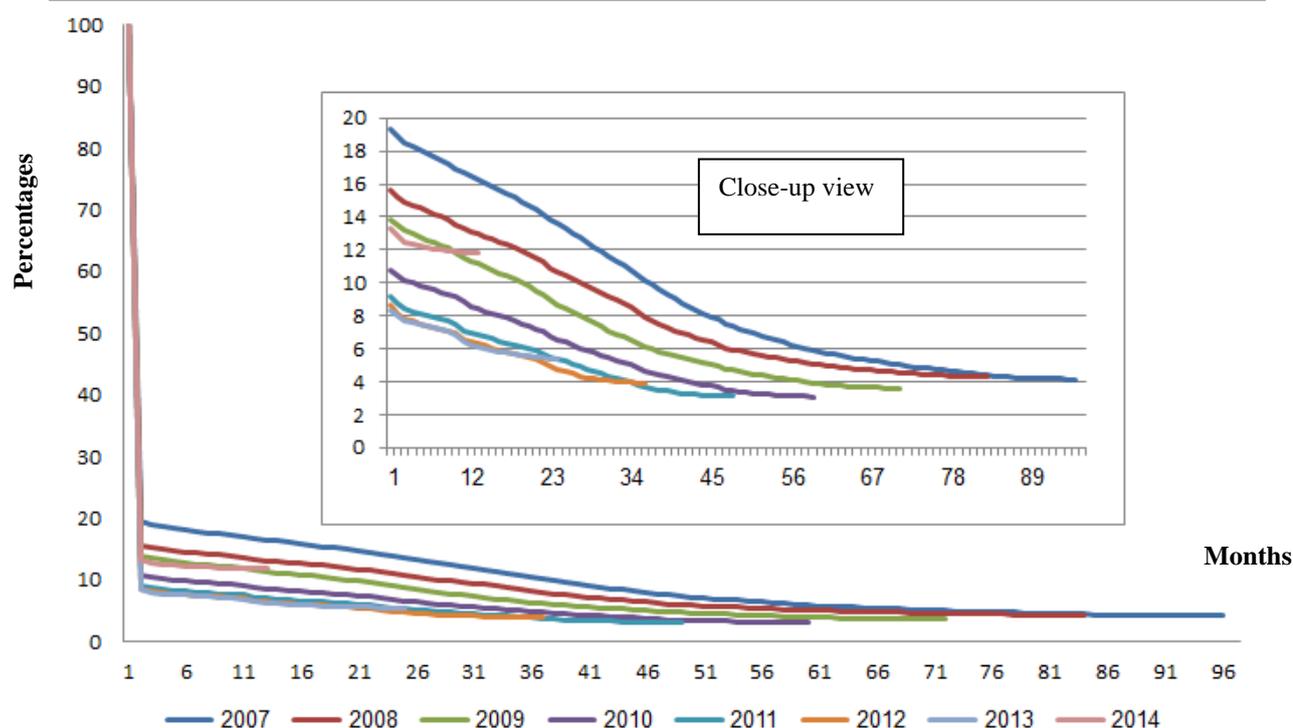
year	Entrants	Stayers	% stayers
2007	45,390	1,616	3.6
2008	50,894	1,901	3.7
2009	52,345	1,731	3.3
2010	72,960	2,149	3.0
2011	82,272	2,528	3.1
2012	83,548	3,215	3.9
2013	84,042	4,547	5.4
2014	60,585	7,166	11.8
Total	532,036	24,893	4.7

**Table 4:**

Calculation of Estimated Overstayers from Philippines, at 2014

	2014
Apparent overstayers	24,893
Workers	16,246
Family formation	3
Status changes	1,448
Estimated overstayers	7,196

**Graph 5:**  
Survival Graph for Entrants from Philippines 2007-2014 and Close-up to first months



### III. Future research

36. We still lack data on exits. The Border Authority does not send us exit records that are not linked to entry records. Even though the linking has improved in the new system, there are still records that are not sent. Therefore, the percentage of stayers is still larger than the actual percentage.

37. Future examinations will include:

- Building the survival curve from the "Rotem" system data. Data exist as of 2009. If we succeed in building a better survival curve from these data, it will be possible to estimate the percentage of stayers to subtract from the final estimate for each year.
- We plan an attempt to build a database at the individual level for all of the entries and exits from Israeli borders since 2009. Enough data has accumulated in the past five years to estimate the data. One problem with the Rotem system is that people entering Israel are recorded in a number of documents. These include foreign passport, Israeli ID card, visa, etc. The system operates such that when the data are brought into the ICBS system, the system selects the main document. Therefore, it might be that sometimes the passport number is not selected as the main document, so the link between the documents is not formed.

**Appendix A:**

Example of Survival Table

year of entrance	monthes in Israel	Departures	Total Enrances	Stayers	% of stayers
2007	1	27231	31544	4313	13.67
2007	2	435	31544	3878	12.29
2007	3	413	31544	3465	10.98
2007	4	236	31544	3229	10.24
...	...	...	...	...	...
2007	80	1	31544	719	2.28
2007	81	1	31544	718	2.28
2007	82	1	31544	717	2.27
2007	84	2	31544	715	2.27
2007	86	3	31544	712	2.26
2007	91	1	31544	711	2.25
2007	not known	248	31544	463	1.47
2008	1	41530	45525	3995	8.78
2008	2	561	45525	3434	7.54
2008	3	470	45525	2964	6.51
2008	4	181	45525	2783	6.11
...	...	...	...	...	...
2008	74	1	45525	1109	2.44
2008	76	1	45525	1108	2.43
2008	79	1	45525	1107	2.43
2008	80	1	45525	1106	2.43
2008	not known	262	45525	844	1.85
2009	1	32117	35134	3017	8.59
2009	2	517	35134	2500	7.12
2009	3	505	35134	1995	5.68
2009	4	129	35134	1866	5.31
...	...	...	...	...	...
2014	1	46106	49470	3364	6.8
2014	2	605	49470	2759	5.58
2014	3	576	49470	2183	4.41
2014	4	97	49470	2086	4.22
2014	5	90	49470	1996	4.03
2014	6	63	49470	1933	3.91
2014	7	45	49470	1888	3.82
2014	8	27	49470	1861	3.76
2014	9	13	49470	1848	3.74
2014	10	11	49470	1837	3.71
2014	11	24	49470	1813	3.66
2014	12	2	49470	1811	3.66
2014	not known	4	49470	1807	3.65