Generating of Figures 1 and 2

We denote by T the set of time intervals, which is indexed by t. In Figures 1 and 2, one hour is defined as the smallest time interval. Then, the real-time populations of RC i at time t ($pop_{i,t}$) can be determined as follows:

$$pop_{i,t} = pop_{i,t-1} + \Theta_{i,t} - \Xi_{i,t}, \forall i, t \geq 1$$
$$pop_{i,0} = p_i, \forall i$$

where $\Theta_{i,t}$ represents the inflow populations of RC i at time t; $\Xi_{i,t}$ represents the outflow populations of RC i at time t; p_i represents the resident populations of RC i. Note that the real-time populations of RCs at time $t = 0$ are equal to the resident populations, since there are no inflow and outflow populations at 0:00 am. Considering that the movement of populations is mainly through the public transport system and that the urban rail transit passenger flow accounts for 50.73% of the public transport passenger flow in Shanghai (http://www.shmetro.com/node70/node72/201705/con114909.htm), $\Theta_{i,t}$ and $\Xi_{i,t}$ are approximately equal to 1.97 (1/0.5073) times $a_{i,t}$ and $b_{i,t}$ respectively, where $a_{i,t}$ denotes the number of urban rail transit passengers that flow into RC i at time t, and $b_{i,t}$ denotes the number of urban rail transit passengers that flow out RC i at time t.

To show diurnal population shifts, two RCs located in Lujiazui commercial region and 11 RCs located in Pengpu residential region are chosen as the target. The resident populations of these chosen RCs are listed in Tables 1 and 2. For these two RCs located in Lujiazui commercial region, the real-time net flow of urban rail transit passengers ($\sum_{i=1}^{2}(a_{i,t} - b_{i,t})$), the real-time net flow of RCs ($\sum_{i=1}^{2}(\Theta_{i,t} - \Xi_{i,t})$), and the real-time populations of RCs ($\sum_{i=1}^{2} pop_{i,t}$) are given in Table 3. For these 11 RCs located in Pengpu residential region, the real-time net flow of urban rail transit passengers ($\sum_{i=1}^{11}(a_{i,t} - b_{i,t})$), the real-time net flow of RCs ($\sum_{i=1}^{11}(\Theta_{i,t} - \Xi_{i,t})$), and the real-time populations of RCs ($\sum_{i=1}^{11} pop_{i,t}$) are given in Table 4. Finally, based on the data of column 4 in Tables 3 and 4, Figures 1 and 2 are depicted.

Note that the data of resident populations and the real-time information on urban rail transit passenger flow can be obtained from the 2010 Economic and Social Development Statistics Yearbook of Shanghai (http://www.stats-sh.gov.cn/data/toTjnj.xhtml) and Shanghai metro website (http://service.shmetro.com/klssxx/index.htm), respectively.

Table 1. Resident populations of these two RCs located in Lujiazui commercial region

RC	Resident populations	Total
Binjiang 1	6,068	8,613
Binjiang 2	2,545	

Table 2. Resident populations of these 11 RCs located in Pengpu residential region

RC	Resident populations	Total
935 Lane, Wenxi Road	4,034	
First RC	5,508	
Hongquan	3,033	
Gonghexin Road	2,520	
Changzhong	1,633	
Xingfu 1 Village	3,098	38,646
770 Lane, Sanquan Road	3,362	
894 Lane, Linfen Road	7,121	
430 Lane, Quwo Road	2,893	
Baoping	3,113	
Xingfu 2 Village	2,331	

Table 3. Real-time populations of these two RCs located in Lujiazui commercial region

Time	$\sum\limits_{i=1}^{2}\left(a_{i,t}-b_{i,t}\right)$	$\sum\limits_{i=1}^{2}\left(\Theta_{i,t}-\Xi_{i,t}\right)$	$\sum\limits_{i=1}^{2}pop_{i,t}$
0 am	0	0	8,613
1 am	0	0	8,613
2 am	0	0	8,613
3 am	0	0	8,613
4 am	0	0	8,613
5 am	0	0	8,613
6 am	1,600	3,154	11,767
7 am	7,300	14,390	26,157
8 am	10,100	19,909	46,066
9 am	7,600	14,981	61,047
10 am	3,000	5,914	66,961
11 am	200	394	67,355
12 am	0	0	67,355
1 pm	0	0	67,355
2 pm	0	0	67,355
3 pm	0	0	67,355
4 pm	-3,000	-5,914	61,441
5 pm	-3,400	-6,702	54,739
6 pm	-10,400	-20,501	34,238
7 pm	-7,600	-14,981	19,257
8 pm	-2,000	-3,942	15,315
9 pm	-1,900	-3,745	11,570
10 pm	-1,500	-2,957	8,613
11 pm	0	0	8,613
12 pm	0	0	8,613

Table 4. Real-time populations of these 11 RCs located in Pengpu residential region

| Time	$\sum\limits_{i=1}^{11}\left(a_{i,t}-b_{i,t}\right)$	$\sum\limits_{i=1}^{11}\left(\Theta_{i,t}-\Xi_{i,t}\right)$	$\sum\limits_{i=1}^{11} pop_{i,t}$
0 am	0	0	38,646
1 am	0	0	38,646
2 am	0	0	38,646
3 am	0	0	38,646
4 am	0	0	38,646
5 am	0	0	38,646
6 am	-300	-591	38,055
7 am	-2,600	-5,125	32,930
8 am	-5,500	-10,842	22,088
9 am	-5,000	-9,856	12,232
10 am	-1,200	-2,365	9,867
11 am	-600	-1,183	8,684
12 am	0	0	8,684
1 pm	0	0	8,684
2 pm	0	0	8,684
3 pm	0	0	8,684
4 pm	300	591	9,275
5 pm	1,200	2,365	11,640
6 pm	4,800	9,462	21,102
7 pm	5,200	10,250	31,352
8 pm	2,200	4,337	35,689
9 pm	900	1,774	37,463
10 pm	600	1,183	38,646
11 pm	0	0	38,646
12 pm	0	0	38,646
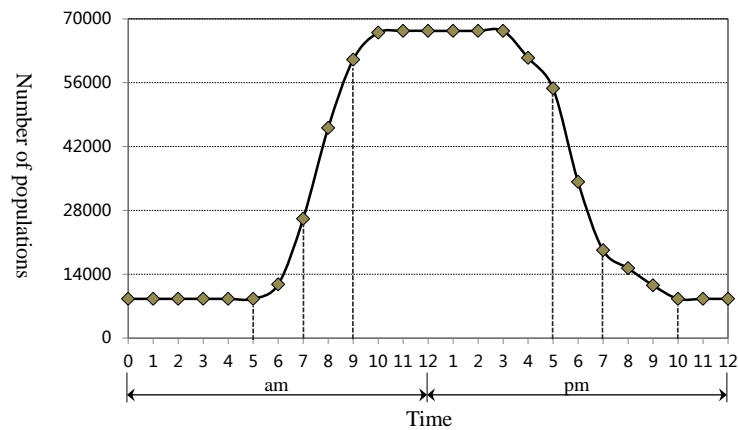
Figure 1. Trends in population variation for RCs located in Shanghai's a commercial region in a typical 24 hour day
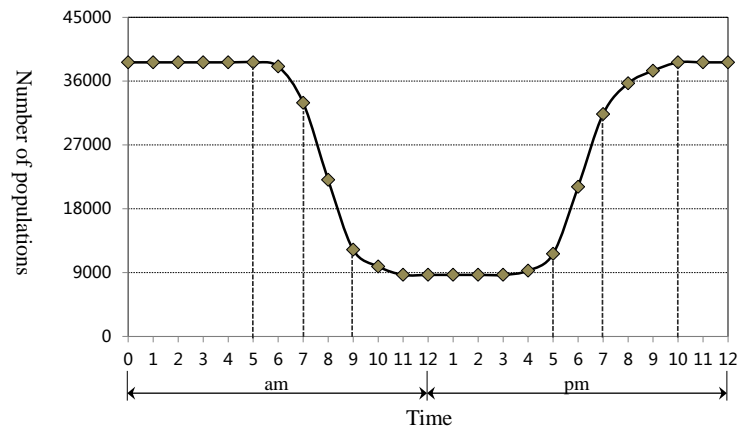
Figure 2. Trends in population variation for RCs located in Shanghai's a
residential region in a typical 24 hour day