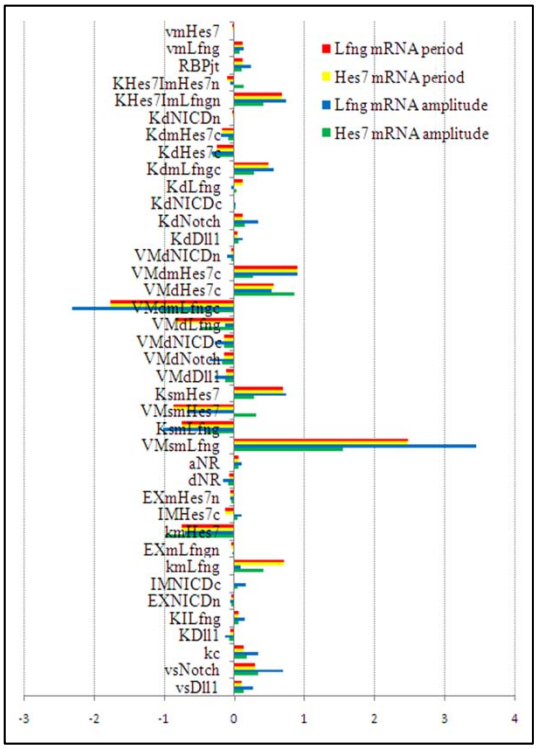

Figure S1. The parameter sensitivity of the single Notch pathway model under the perturbation level 1%.

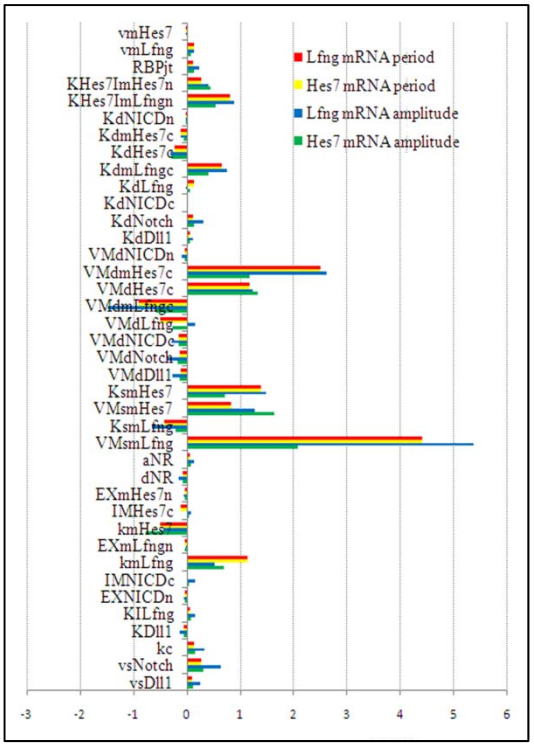

Figure S2. The parameter sensitivity of the single Notch pathway model under the perturbation level 10%.

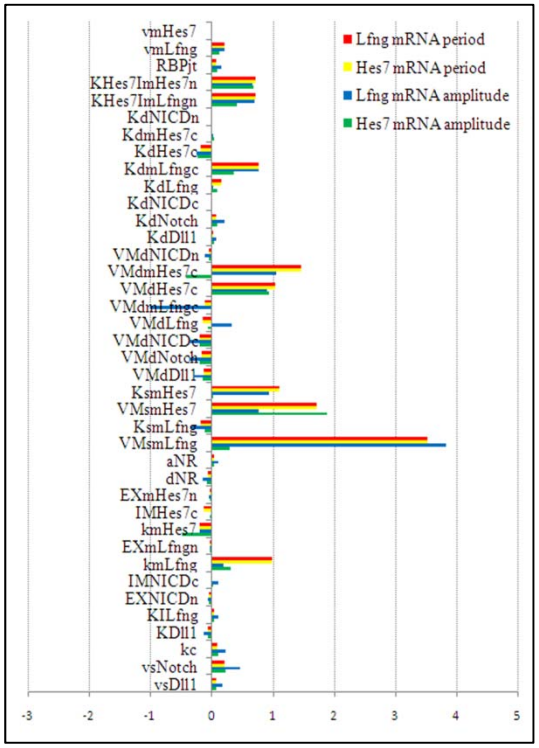

Figure S3. The parameter sensitivity of the single Notch pathway model under the perturbation level 50%.

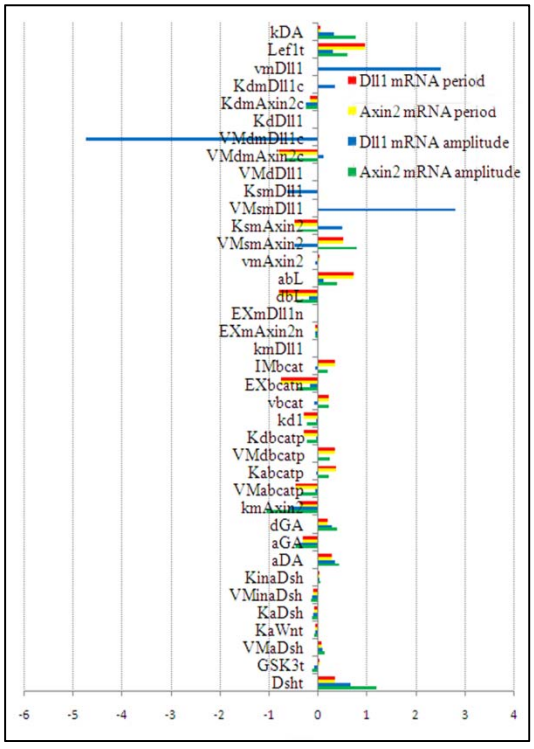

Figure S4. The parameter sensitivity of the single Wnt pathway model under the perturbation level 1%.

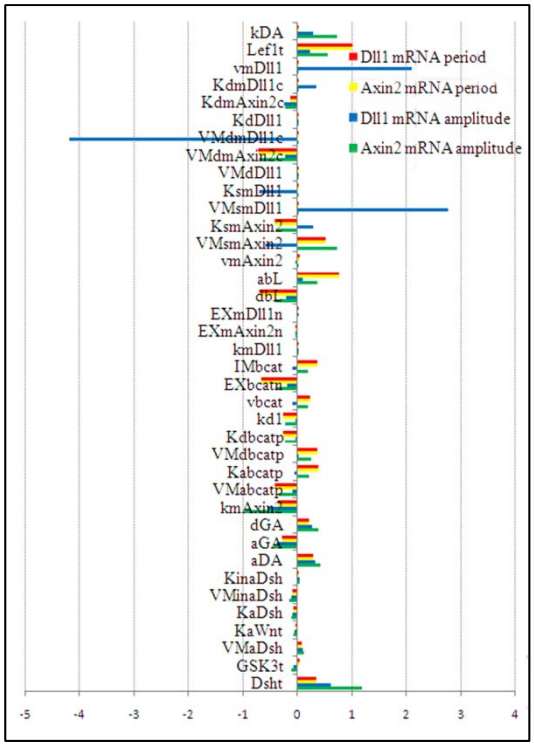

Figure S5. The parameter sensitivity of the single Wnt pathway model under the perturbation level 10%.

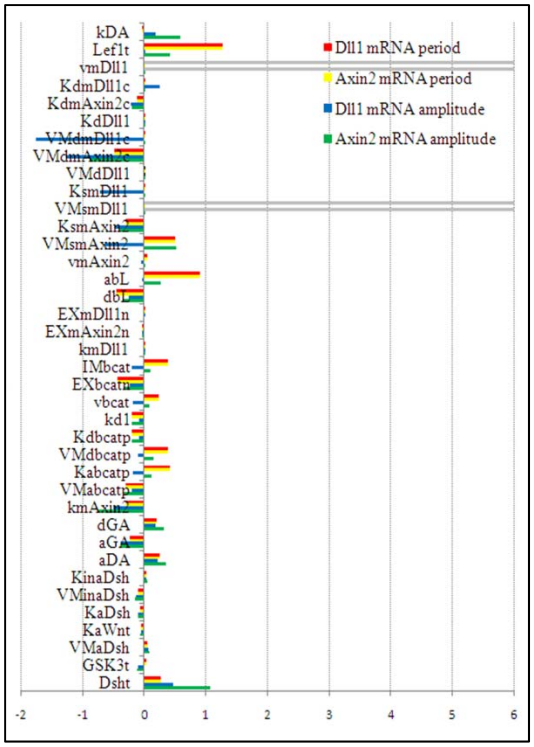

Figure S6. The parameter sensitivity of the single Wnt pathway model under the perturbation level 50%.

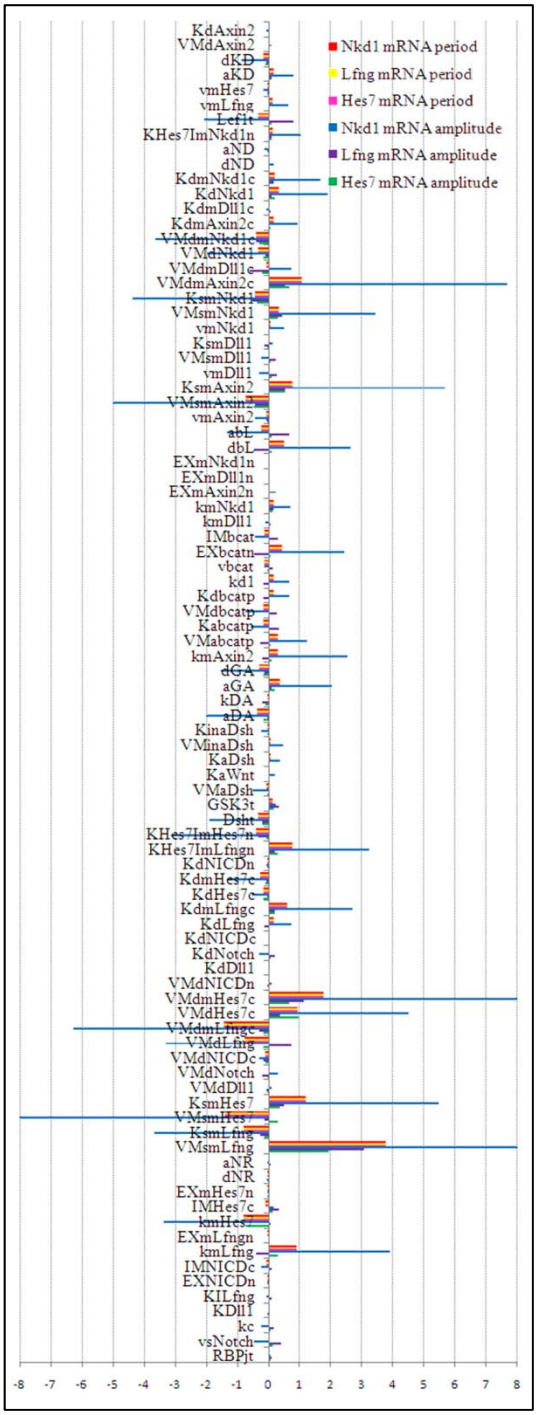

Figure S7. The parameter sensitivity of the combined model taking the genes oscillating synchronously with Hes7 as output under the perturbation level 1%.

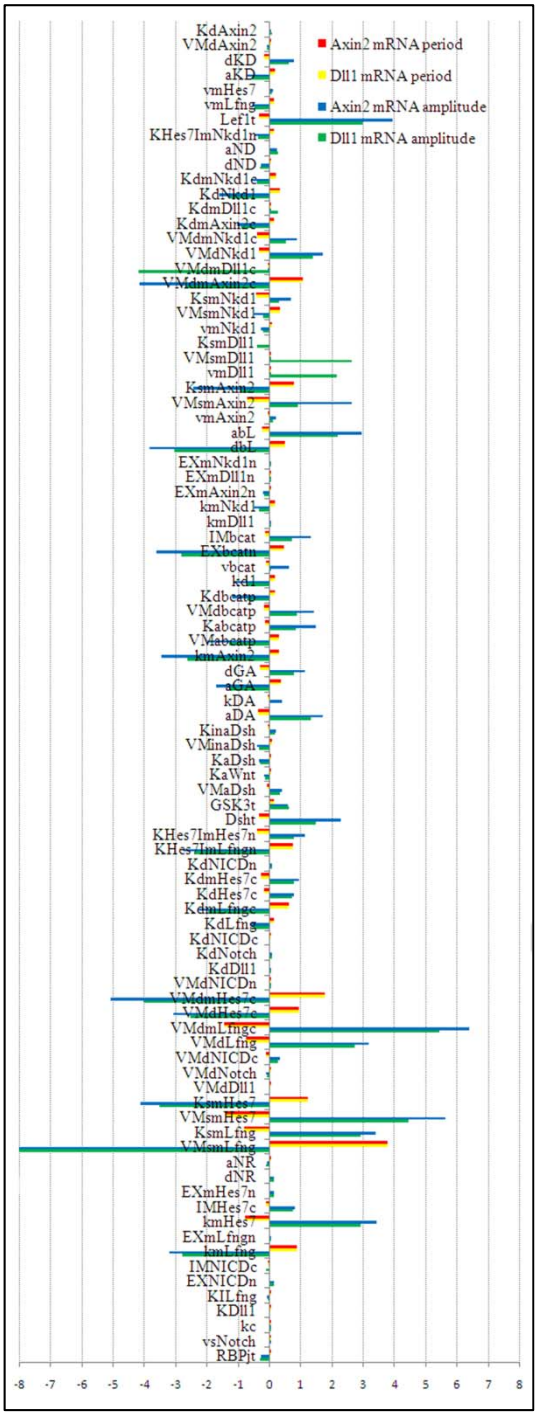

Figure S8. The parameter sensitivity of the combined model taking the genes oscillating synchronously with Axin2 as output under the perturbation level 1%.

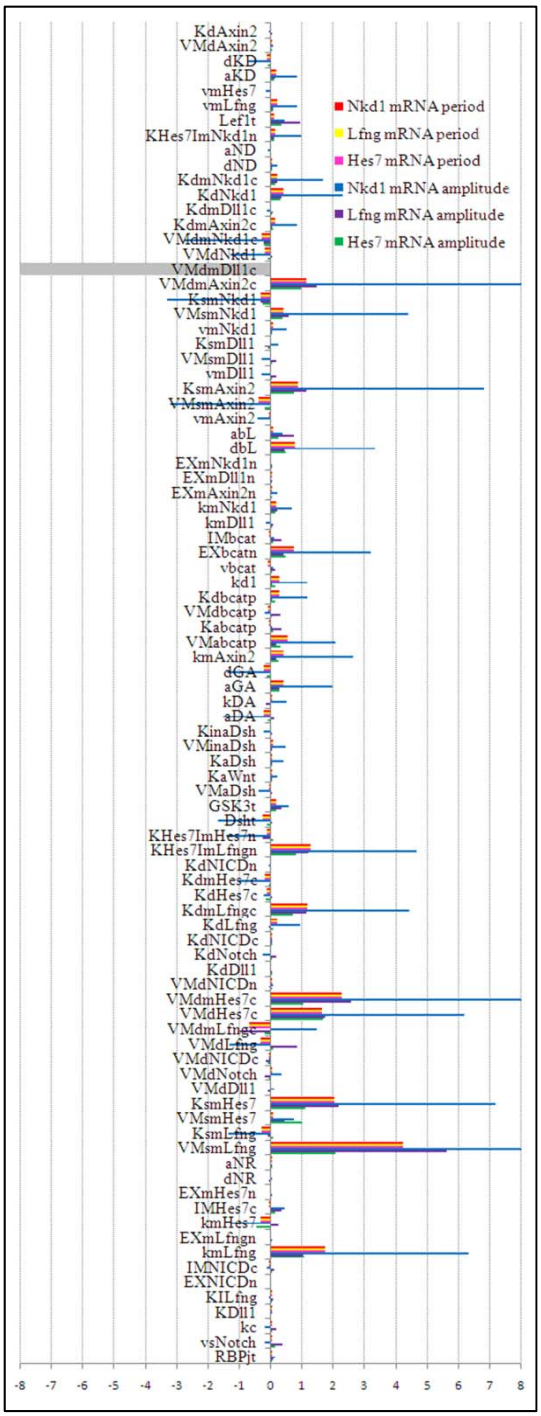

Figure S9. The parameter sensitivity of the combined model taking the genes oscillating synchronously with Hes7 as output under the perturbation level 10%.

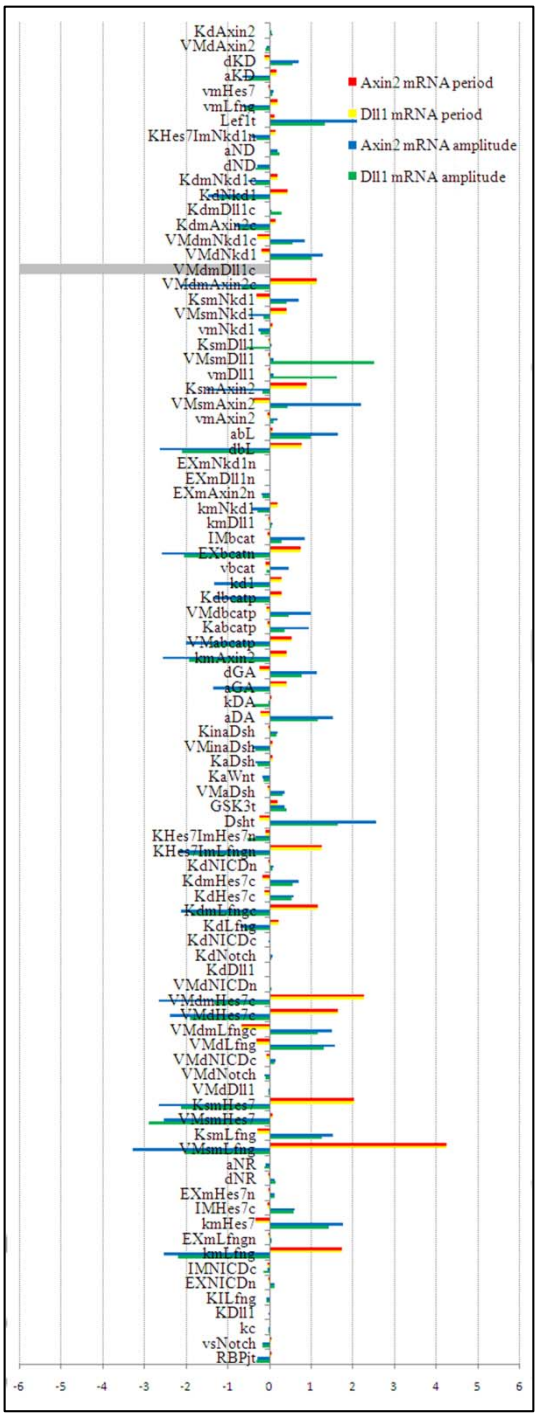

Figure S10. The parameter sensitivity of the combined model taking the genes oscillating synchronously with Axin2 as output under the perturbation level 10%.

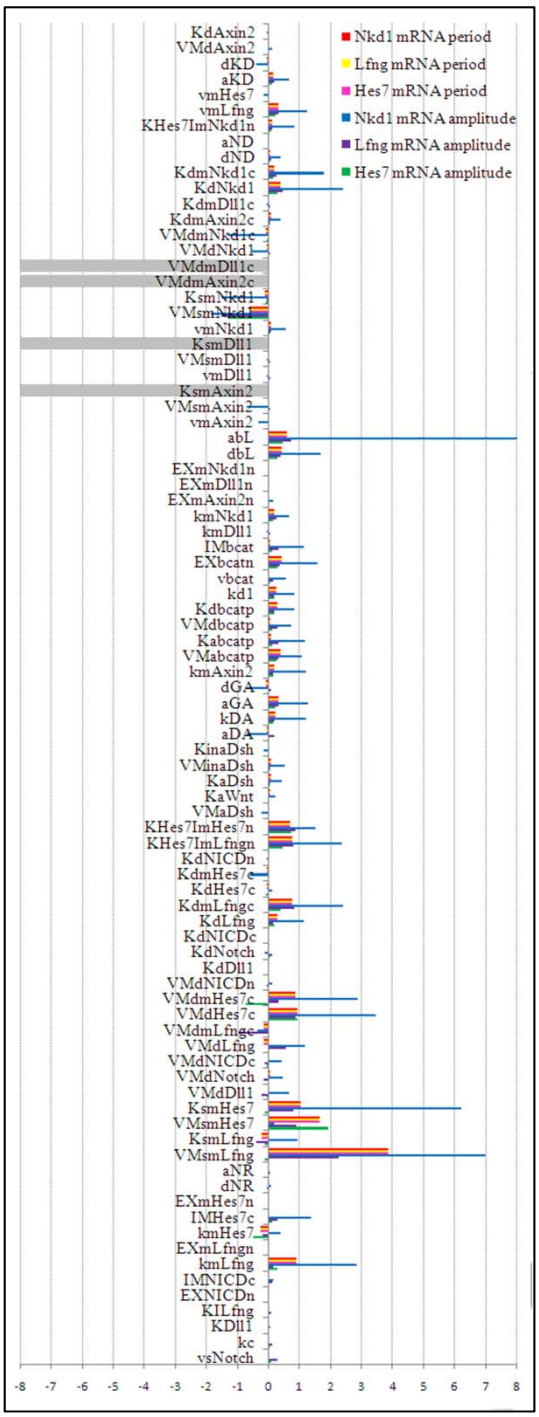

Figure S11. The parameter sensitivity of the combined model taking the genes oscillating synchronously with Hes7 as output under the perturbation level 50%.

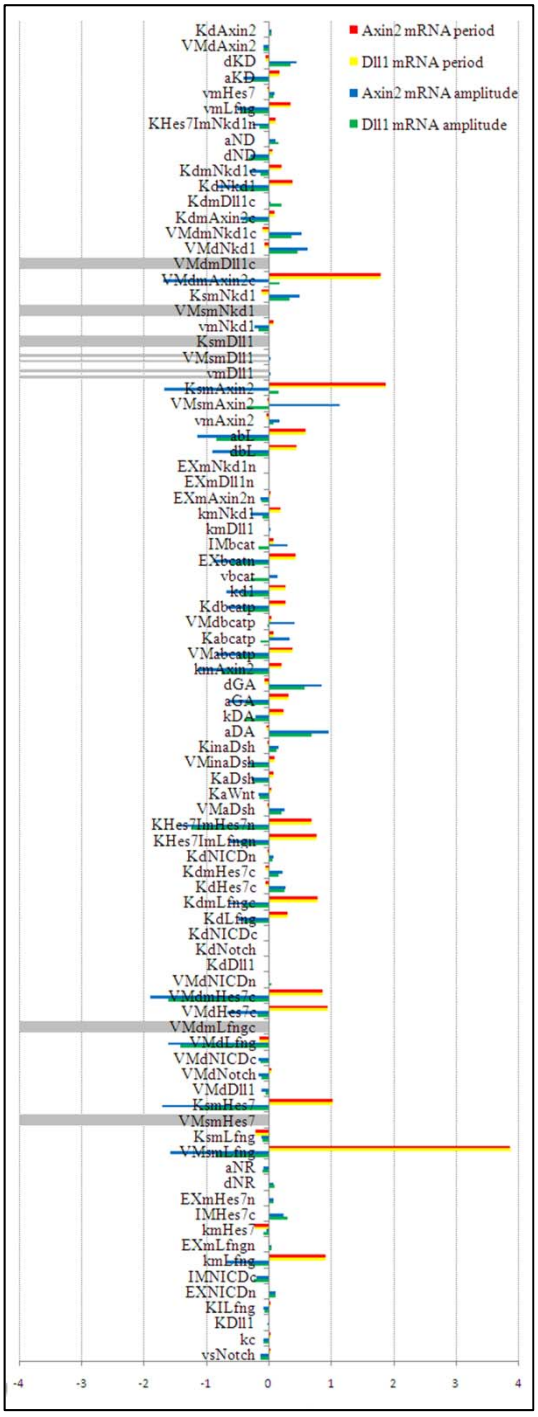

Figure S12. The parameter sensitivity of the combined model taking the genes oscillating synchronously with Axin2 as output under the perturbation level 50%.

Table S7. The parameters to which the oscillating periods or amplitudes of Notch target genes are significantly sensitive in different perturbation levels in the single Notch pathway model.

gene	Sensitivity type	Perturbation intensity		
		1%	10%	50%
Lfng	**period**	VMsmLfng(2.48) VMdmLfngc(-1.76)	VMsmLfng(4.4) VMdmHes7c(2.5) KsmHes7(1.38) VMdHes7c(1.16) kmLfng(1.13)	VMsmLfng(3.52) VMsmHes7(1.72) VMdmHes7c(1.47) KsmHes7(1.11) VMdHes7c(1.04)
	amplitude	VMsmLfng(3.45) VMdmLfngc(-2.31) KsmLfng(-1.01)	VMsmLfng(5.36) VMdmHes7c(2.62) VMdmLfngc(-1.49) KsmHes7(1.48) VMsmHes7(1.27) VMdHes7c(1.24)	VMsmLfng(3.83) VMdmHes7c(1.07) VMdmLfngc(-1)
Hes7	**period**	VMsmLfng(2.48) VMdLfngc(-1.76)	VMsmLfng(2.08) VMdmHes7c(2.5) VMdHes7c(1.16) KsmHes7(1.38) kmLfng(1.13)	VMsmLfng(3.52) VMsmHes7(1.72) VMdmHes7c(1.47) KsmHes7(1.11) VMdHes7c(1.04)
	amplitude	VMsmLfng(1.55) VMdmLfngc(-1.04)	VMsmLfng(4.4) VMsmHes7(1.64) VMdHes7c(1.33) VMdmHes7c(1.17)	VMsmHes7(1.89)

Table S8. The parameters to which the oscillating periods or amplitudes of Wnt target genes are significantly sensitive in different perturbation levels in the single Wnt pathway model.

gene	Sensitivity type	Perturbation intensity		
		1%	10%	50%
Dll1	**period**		Lef1t(1.02)	Lef1t(1.27)
	amplitude	VMdmDll1c(-4.74) VMsDll1(2.81) vmDll1(2.52)	VMdmDll1c(-4.17) VMsDll1(2.77) vmDll1(2.1)	VMdmDll1c(-1.75) VMdmAxin2c(-1.27)
Axin2	**period**		Lef1t(1.02)	Lef1t(1.27)
	amplitude	Dsht(1.21) kmAxin2(-1.04)	Dsht(1.18)	Dsht(1.07)

Table S9. The parameters to which the oscillating periods or amplitudes of target genes are significantly sensitive in different perturbation levels in the combined model.

gene	Sensitivity type	Perturbation intensity		
		1%	**10%**	**50%**
Lfng	**period**	VMsmLfng(3.78) VMdmHes7c(1.76) VMdmLfngc(-1.45) VMsmHes7(-1.41) KsmHes7(1.22) VMdmAxin2c(1.05)	VMsmLfng(4.24) VMdmHes7c(2.28) KsmHes7c(2.03) kmLfng(1.72) VMdHes7c(1.64) KHes7ImLfngn(1.26) KdmLfngc(1.16) VMdmAxin2c(1.14)	VMsmLfng(3.88) VMsmHes7(1.64) KsmHes7(1.02)
	amplitude	VMsmLfng(3.07) VMdmDll1c(-1.84) VMdLfng(1.28) Lef1t(1.27) kmLfng(-1.12) VMsmHes7(1.04)	VMsmLfng(5.61) VMdmHes7c(2.56) KsmHes7(2.19) VMdHes7c(1.74) VMdmAxin2c(1.48) KHes7ImLfngn(1.2) KsmAxin2(1.16) KdmLfngc(1.13) kmLfng(1.05)	VMsmLfng(2.27) VMsmNkd1(-1.52)
Hes7	**period**	VMsmLfng(3.78) VMdmHes7c(1.76) VMdmLfngc(-1.45) VMsmHes7(-1.41) KsmHes7(1.22) VMdmAxin2c(1.05)	VMsmLfng(4.24) VMdmHes7c(2.28) KsmHes7c(2.03) kmLfng(1.72) VMdHes7c(1.64) KHes7ImLfngn(1.26) KdmLfngc(1.16) VMdmAxin2c(1.14)	VMsmLfng(3.88) VMsmHes7(1.64) KsmHes7(1.02)
	amplitude	VMsmLfng(1.94) VMdmHes7c(1.15)	VMsmLfng(2.09) VMdHes7c(1.68) KsmHes7(1.13) kmLfng(1.09) VMdmHes7c(1.03)	VMsmHes7(1.9) VMsmNkd1(-1.31)
Nkd1	**period**	VMsmLfng(3.78) VMdmHes7c(1.76) VMdmLfngc(-1.45) VMsmHes7(-1.41) KsmHes7(1.22) VMdmAxin2c(1.05)	VMsmLfng(4.24) VMdmHes7c(2.28) KsmHes7c(2.03) kmLfng(1.72) VMdHes7c(1.64) KHes7ImLfngn(1.26) KdmLfngc(1.16)	VMsmLfng(3.88) VMsmHes7(1.64) KsmHes7(1.02)

			VMdmAxin2c(1.14)	
	amplitude	VMsmLfng(15.56) VMdmHes7c(9.41) VMsmHes7(-8.51) VMdmAxin2c(7.68) VMdmLfngc(-6.29) KsmAxin2(5.67) KsmHes7(5.48) VMsmAxin2(-5.01) VMdHes7c(4.52) KsmNkd1(-4.36) KsmLfng(-3.67) VMdmNkd1c(-3.66) VMsmNkd1(3.42) kmHes7(-3.39) VMdLfng(-3.32) KHes7ImLfngn(3.23) KHes7ImHes7n(-3.16) kmLfng(3.01) KdmLfngc(2.7) dbL(2.65) kmAxin2(2.55) EXbcatn(2.43) aGA(2.04) aDA(-2) VMdNkd1(-1.98) KdNkd1(1.91) KdmNkd1c(1.65) dGA(-1.55) abL(-1.33) KdmHes7c(-1.32) VMabcatp(1.24)) KdmNkd1c(1.09) KHes7ImNkd1n(1.02)	VMsmLfng(12.13) VMdmHes7c(10.79) VMdmAxin2c(8.8) KsmHes7(7.18) kmLfng(6.32) VMdHes7c(6.19) KHes7ImLfngn(4.66) KdmLfngc(4.42) VMsmNkd1(4.4) dbL(3.34) KsmNkd1(-3.29) EXbcatn(3.2) VMsmAxin2(-3.19) VMdmNkd1c(-2.78) kmAxin2(2.63) KdNkd1(2.31) VMabcatp(2.09) aGA(1.99) KdmNkd1c(1.68) aDA(-1.52) VMdmLfngc(1.48) KHes7ImHes7n(-1.41) dGA(-1.36) KsmLfng(-1.36) VMdLfng(-1.3) kmHes7(-1.29) VMdNkd1(-1.27) Kdbcatp(1.18) kd1(1.17) KsmAxin2(1.16)	abL(10.16) VMsmLfng(7.01) KsmHes7(6.21) VMdHes7c(3.44) VMdmHes7c(2.87) kmLfng(2.83) KdNkd1(2.41) KdmLfngc(2.38) KHes7ImLfngn(2.38) VMsmNkd1(-1.85) KdmNkd1c(1.78) dbL(1.68) EXbcatn(1.58) KHes7ImHes7n(1.51) KsmNkd1(-1.51) VMdmNkd1c(-1.31) aGA(1.29) vmLfng(1.23) kDA(1.22) kmAxin2(1.2) VMdLfng(1.18) Kabcatp(1.18) KdLfng(1.14) IMbcat(1.13) VMabcatp(1.07)
Dll1	**period**	VMsmLfng(3.78) VMdmHes7c(1.76) VMdmLfngc(-1.45) VMsmHes7(-1.41) KsmHes7(1.22) VMdmAxin2c(1.05)	VMsmLfng(4.24) VMdmHes7c(2.28) KsmHes7c(2.03) kmLfng(1.72) VMdHes7c(1.64) KHes7ImLfngn(1.26) KdmLfngc(1.16) VMdmAxin2c(1.14)	VMsmLfng(3.88) VMsmHes7(1.64) KsmHes7(1.02)
	amplitude	VMsmLfng(-9.58) VMdmLfngc(5.43)	VMsmHes7(-2.9) VMsDll1(2.5)	VMdmHes7c(-1.61) KHes7Imhes7n(-1.24)

		VMsmHes7(4.45) dbL(-3.06) abL(2.18) KsmHes7(-3.52) EXbcatn(-2.83) VMdmDll1c(-4.2) VMdmAxin2c(-2.68) VMdmHes7c(-4.01) KsmLfng(2.9) kmHes7(2.92) VMdLfng(2.72) kmAxin2(-2.64) VMsmDll1(2.62) VMdHes7c(-2.54) kmLfng(-2.79) VMabcatp(-1.29) KHes7ImLfngn(-2.41) vmDll1(2.13) aDA(1.32) KdmLfngc(-1.97) aGA(-1.3) VMdNkd1(1.4) KdNkd1(-1.32)	kmLfng(-2.2) KsmHes7(-2.12) dbL(-2.11) EXbcatn(-2.05) VMsmLfng(-2.03) VMdmLfngc(1.15) KHes7ImLfngn(-1.96) kmAxin2(-1.94) VMdHes7c(-1.91) KdmLfngc(-1.89) vmDll1(1.62) kmHes7(1.42) VMabcatp(-1.4) VMdmHes7c(-1.33) VMdLfng(1.3) KsmLfng(1.27) KdNkd1(-1.21) aDA(1.15) VMdNkd1(1.02)	VMdLfng(-1.42) KsmHes7(-1.09)
Axin2	**period**	VMsmLfng(3.78) VMdmHes7c(1.76) VMdmLfngc(-1.45) VMsmHes7(-1.41) KsmHes7(1.22) VMdmAxin2c(1.05)	VMsmLfng(4.24) VMdmHes7c(2.28) KsmHes7c(2.03) kmLfng(1.72) VMdHes7c(1.64) KHes7ImLfngn(1.26) KdmLfngc(1.16) VMdmAxin2c(1.14)	VMsmLfng(3.88) VMsmHes7(1.64) KsmHes7(1.02)
	amplitude	VMsmLfng(-10.8) VMdmLfngc(6.38) VMsmHes7(5.61) abL(2.94) dbL(-3.85) VMdmAxin2c(-4.16) EXbcatn(-3.61) VMdmHes7c(-5.08) KsmHes7(-4.13) KsmLfng(3.38) kmHes7(3.42) kmAxin2(-3.46) VMsmAxin2(2.63)	VMsmLfng(-3.28) VMdmHes7c(-2.65) KsmHes7(-2.65) dbL(-2.63) EXbcatn(-2.57) kmAxin2(-2.56) VMsmHes7(-2.53) kmLfng(-2.53) VMdHes7c(-2.39) KHes7ImLfngn(-2.2) VMsmAxin2(2.19) KdmLfngc(-2.13) VMdmAxin2c(-2.13)	VMsmLfng(-1.59) abL(-1.14) VMdmHes7c(-1.9) KHes7ImHes7n(-1.48) VMdLfng(-1.62) VMsmAxin2(1.14) KsmHes7(-1.71) kmAxin2(-1.14)

		VMabcatp(-2) VMdLfng(3.17) KsmAxin2(-2.43) Kabcatp(1.47) VMdHes7c(-3.07) IMbcat(1.32) kmLfng(-3.21) VMdbcatp(1.43) aDA(1.71) KHes7ImLfngn(-2.76) aGA(-1.7) KdmLfngc(-2.26) Kdbcatp(-1.18) kd1(-1.18) VMdNkd1(2.15) dGA(1.14) KdNkd1(-1.59) KHes7IHes7n(1.13) KdmAxin2c(-1.04)	VMabcatp(-2) kmHes7(1.75) abL(1.64) VMdLfng(1.58) KsmAxin2(-1.53) KsmLfng(1.52) aDA(1.51) VMdmLfngc(1.49) KdNkd1(-1.48) aGA(-1.35) Kdbcatp(-1.34) kd1(-1.33) VMdNkd1(1.28) aGA(-1.14)	