Parameter Search

variable	value	objective function	interpretation
η^H	0.15	0.026	New technology benefit
η^M	0.03	0.026	New combination benefit
τ	300	0.026	Shape parameter for idea distribution
ξ	10	0.026	$1/\xi$ is the fraction of viable combinations
λ	2.2	0.026	scale parameter of the cost distribution
κ	5	0.026	shape parameter of the cost distribution

Table 1: Current values that minimize the objective function

Column #	Moment	Model	Data
2	Fraction of new combinations in 1880	45.21%	30%
3	Fraction of new technologies in 1880	10.1%	10%
5	Fraction of new combinations in 1930	64.16%	60%
6	Fraction of new technologies in 1930	5.42%	3%
7	Peak of the refinement share	62.3%	60%
8	Year of the peak in refinement share	1849	1870

Table 2: Moments (the missing column numbers are the moments I dropped relative to the old specification). Obs.: column 8 is not included as an argument in the objective function $\Rightarrow$ still under-identified.
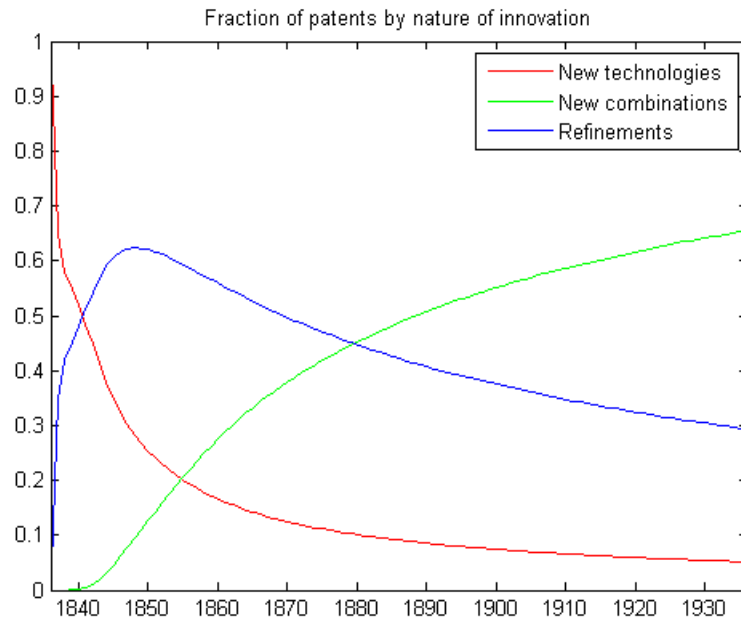

Figure 1: Fraction of patents by type

Sensitivity analysis

Parameter changed	NC 1880	NT 1880	NC 1930	NT 1930	Peak of reuse	Year of peak
η^H	0.25314	0.077351	0.45259	0.040606	0.79891	1851
η^M	0.44517	0.1036	0.63846	0.055556	0.62018	1850
τ	0.41794	0.093815	0.61242	0.05038	0.66305	1850
λ	0.56153	0.11383	0.73459	0.061152	0.51344	1848
κ	0.47448	0.10177	0.66667	0.054808	0.6135	1849
ξ	0.48193	0.10102	0.66175	0.05405	0.59305	1849
Baseline	0.4521	0.101	0.6416	0.0542	0.623	1849
data	0.3	0.1	0.6	0.03	0.6	1870

Table 3: Variation in moments given 20% decrease in parameter values.

From table 3, η^H and λ are driving most of the change. τ, κ and ξ also seem to have a considerable effect on the fraction of new combinations. η^M has the weakest effect in all moments.
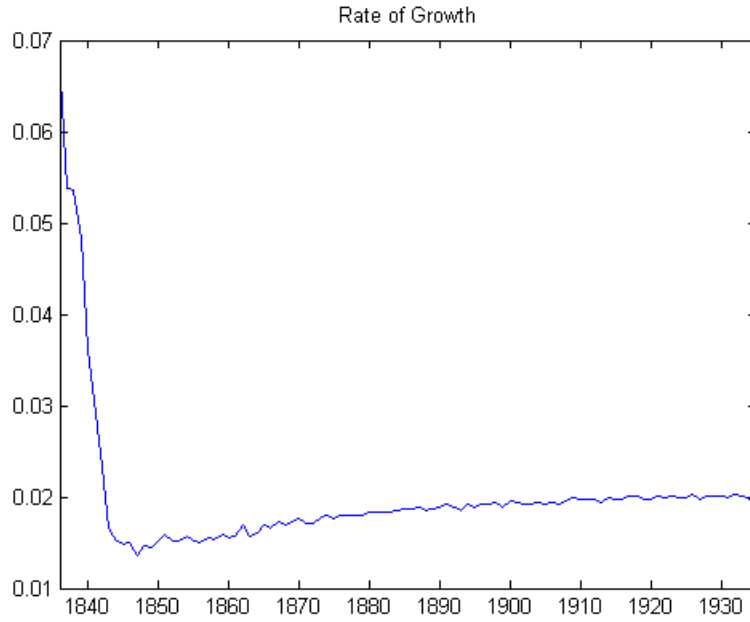
Rate of Growth

Figure 2: Growth rate of economy

Figure 2 has the rate of growth of the economy. It was computed by taking the average patent quality among firms. I chose the number of firms to yield an average growth rate of 2%, which gave 683 firms.

Until around 1845, the rate of growth seems to be affected the most by the movement of the fraction of new technologies. This feature can be somewhat "artificial", happening mainly because we define the fraction of new technologies in 1836 to be equal to 1. Soon after that, this effect fades out and the rate of growth seems to stabilize around 2%, the historical mean.

Note that there is a slight increase in the rate of growth, as the fraction of new combinations increases as well.
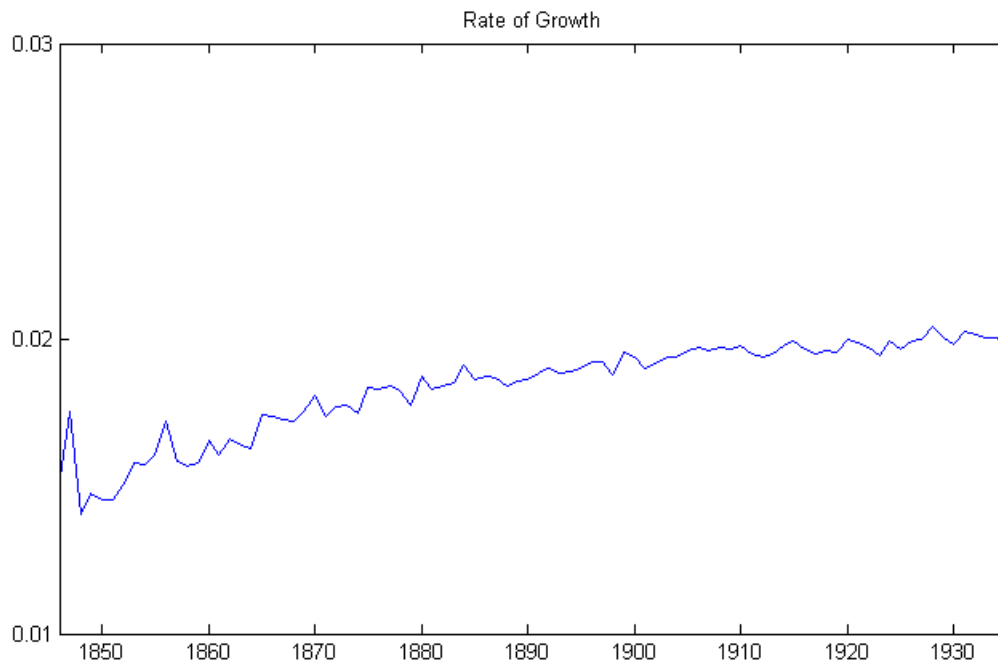
If we zoom in on the rate of growth starting at 1846 instead, we get figure 3:

Figure 3: Growth rate of economy after 1846.