A Longitudinal Study of Language Adaptation at Multiple Timescales in Native- and Non-Native Speakers

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Participants: IS19 (boy, blue sweatshirt), S1 (boy, black vest)

Context: IS19 is teaching a recitation at the whiteboard.

0:00

xxx IS19: and this is the-
xxx the old one?
xxx and this is the new one.
xxx and we can see
xxx um
xxx in the long run there will be a (.)
xxx increase in the output because
xxx uh
xxx the capital in steady state will in-increase.
xxx but currently,
xxx ((pause))
xxx I mean when the-
xxx when the uh
xxx savings rate jumps from this value to that value
xxx the capistal-
xxx the capital stock will be the same.
xxx in will (. ) stay in this point.
xxx in the current period.
xxx and that is (.) (pointing to words on whiteboard))
xxx the immediate effect.
xxx but then the capital will change in next period.
xxx and it will converge with this new steady state.
xxx so the capital will (. ) only change from the next period.
xxx not this period.
xxx so there is no↑ (.) immediate effect on the capital.
xxx and,
xxx if you understand,
xxx this immediate e- this immediate effect on capital .
xxx it’s easy to find out that um
xxx the income
xxx the immediate(.) ly-
xxx there is no immediate effect on um
xxx output↓ because
xxx the output by the production function equals to
xxx uh
xxx equal- I mean (.) only depends on the capital.
xxx so if the capital is the same,
there will be no change in the consumption.
s- I- I mean the- the output
that means the output is also two.
((pause))
after l- after the change.

so (. ) let me denote it by a (. ) different notation↑
so (. ) maybe y prime
y prime is the output after this-
after this change immediately.
so it will (. ) stay at (. ) this level.
but for the consumption,
the (cell) rate is different because
although this- (. ) although this income is the same,
we have a new saving rate now.
instead of a point two,
now we have a point five for the saving rate.
so here it is
the new savings rate which is
point five.
and this new output
is- is the same as previous.
so it’s two,
and we can
find out
the consumption,
the immediate consumption after this changes
is one.
so for the immediate (. ) effect we compare
these numbers with (. ) these numbers.
remember these two values are the (. ) values bef-
before this change
when the saving rate is point two
and (. ) we compare this number with
this number.

3:00
for the immediate effect.
so there’s no effect on the output.
both of the values are two.
but
the value of consumption is different.
now it decreases to one.
so although in the long run
the consumption will increase from this-
from one point six to two point five,
but immediately the consumption will actually decrease
((pause))
so (. ) any question about (. ) “this”?
((pause))
and you remember the
key point for this immediate effect is that,
**immediately there is no change in the capital stock**
whatever the change for the other parameters
as the- as or ↓
the stock will always stay the same immediately
in this period.
so that’s the (. ) start point
for our a-analysis of this effect.
and from this-,
from this fact that k is the same
so (. ) k prime equals two.
because for this k star,
we can get this-
this output after this change.
in this period. (. ) it’s also the same.
and then from the definition of this consumption,
we can find out the new value.
the new immediate value.
in this (. ) period for the consumption.
and then we compare this-
this-
uh I mean the corresponding numbers
so before and after the change.
((pause))
so,
((looking at papers))
well now let’s
move to the last question,
question four,
((pause to erase the whiteboard and get a new marker))
part a,
there is a: decrease in the depreciation rate,
so the depreciation rate decrease,
and let me denote delta one as the depreciation bef-
before this decrease,
and delta two as the
one after the decrease
so delta one is
greater than delta two.
and use the graphs to illustrate
how the steady state and golden rule change.
so first let me do the steady state one.
so for the graph to illustrate steady state,
we first draw (.) the break even line
which is
n plus g plus delta one.
because now there is a change in the depreciation rate
times k.
and then draw (.). the line for (.). savings,
which is s times f k.
so there’s that for this a- analysis of the-
uh steady state,
this curve is s times f of the production function
and this curve will be different for the golden rule.
analysis.
and this intersection,
is the steady state level.
so it’s k star.
and now we have a decrease in the-
in the depreciation rate.
that means (.). the slope of this break even line
will be smaller.
so this line will go downward.
((pause to draw a line on the board))
sorry.
((pause to replace dried out marker))
so this is the new break even line.
it’s n plus g plus delta two,
times k.
because this delta two is (.). less than delta one.
so this line is below the- the previous one.
and we can get a n-
new intersection,
which implies the new
steady state.
so from this graph
uh it’s obvious that
the level in steady state (.). increase
for the capital.
((pause))
and for the golden rule,
we use a slightly different curve. and so notice that this horizontal axis is capital, is \( k \), and this vertical axis is- can be output or investment or savings.

9:01

because all these variables has the same units. so we can use this (. ) same axis to denote uh several uh variables.

((IS19 pronounces the word variable like the word reliable)) and this is \( k \).

so (. ) again we draw this (. ) break even line. it’s \( n + g + \text{ delta one} \).

((pause)) but here notice that this curve is the production function. there is no s before this (. ) function. so these two are different. and also we do not uh care about this intersection. we care about our tangent point.

at which the tangent line is- ((pause)) is parallel to this (. ) break even line. ((pause)) and this (. ) tangent point is the golden rule level. so it’s the \( k g r \). so why we have this point in the graph because remem- remember for the steady state the condition is \( s \) times

\[ f \ k^\uparrow \text{ equals the break even level.} \]

and in graph, uh it is just the intersection of these two line because this line is the break even line and this is the savings. but for the (. ) golden rule level, the condition we use is \( m \ p \ k \) equals to
m plus g plus delta,
and m p k is the (. ) slope,
or the tangent line of this production
function,
and the m plus g plus delta is the,
slope of this break even line.
and this condition means that
these two lines are parallel.
because from the equation
they are equal to each other.
so that’s why this tangent point (. )
is the golden rule level.
and now again
this depreciation rate decrease.
so the
new break even line is flatter than the previous one.
this is n plus g plus delta two,
times k.
and again we draw a
tangent - tangent line that is
parallel to this line.
to this new line.

12:00

increase.
because of the decrease in the (. ) depreciation rate.
((pause))
so it goes from this value to this value.
and for the steady state it goes from here to there.
((pause to look at papers))
and,
also what is the effect on the long run growth rate,
of income ((unreadable))
so
you should notice (. ) two words,
the first one is the growth rate
and the income ((unreadable))
and you should be very clear that
the growth rate and level are two different things.
because all the values you calculated here,
the k one or the k star y star and c star
all that values are (.) levels.
and- but the growth-
but for the growth rate you should refer to the
table, that the i-instructor gave you in the class,
so,
((pause to erase whiteboard))
remember that the gr- the growth rate
((pause))
of uh
((pause))
of output
per capita,
or per worker,
which is (.) y over l
equals to g.
the growth rate of technology.
right,
it is (.) in your notes,
in the- in a table.
so (.) and here under the assumption
there is only a decrease in the depreciation rate.
and
this (.) small g is- is constant.
so there is no effect on the growth rate of the
output per worker.
((pauses to correct a spelling mistake on the board))
so (.) for part two there is-
the answer is no effect.
because this g (.) doesn’t change.
and
for part b,
now suppose there is a
decrease in the population growth rate.
so now the n decrease
that means (.) n one
the growth rate before the change is
greater than n two.
and
actually the result is the same because
uh
now what i- what (we) have is
the delta is the same.
but the growth rate of ca- of population is different.
and because n two is less than n one
so again this break even line
the slope of that line
is smaller.
and the-
the analysis and the result are actually the same.
and this is the old one when the (.) population growth
rate decrease
and this is the (.) new one.
((pause))
and you can
also figure out that
this steady state value increase.
because no matter,
what the
w-what no matter whether it’s the
uh population growth rate decrease
or the depreciation rate decrease,
this- the slope of this line will-
will both be- uh will both decreasing.
so (.) that means
that the result of the (analysis) is the same.
so you can draw two,
I mean y-you draw the two, same graph.
but pay attention to this (.) break even line.
because now there is a change in n not delta.
((pause))
and there are two main difference in the (.) graph
of the steady state and the golden rule.
the first one is that in steady state
here this curve is s times (.) f k and
in the golden rule (.)
analysis this is a production function.
there is no s.
in the front.
and (.) the other one is that
for the steady state,
you care about this intersection.
but for this (.) golden rule
you care about this tangent point.
the tangent point is golden rule value
and this intersection is (.) steady state value.
so- and what is the effect on the long run level
we have talk about it it increase.

and (.) now for the ↑income.

so as we know
the capital-
uh the capital increase
and so does the income because
by the (.) production function,
y equals to f k.
so if k increase
y must increase.
because this is an increasing function.
and the third line is what is the effect on the long run
growth rate of real gdp.

so
((pause))
so the growth rate
of
real (.) gdp
or (.) total output.
they have the same meaning.
equals to n ↑plus g.
and you can also find this result in the table.
and now the g,
is the same.
it is constant but
there is a decrease in-
in the- in the population growth rate.
under the assumption.
so this whole thing (.) will decrease.
and so does this growth rate of (.)
real gdp or total output.

((pause to look at papers and check watch))
so.
yes that’s the answer for
question three and four,
and for
ques-
for the first two question you can refer to the (.) notes?
and (.) i just want to talk about
uh question two for the (.)
first part so what is relationship,
of these four policies with (solo) model.
so as we know there are four policies the first one is to increase um to increase the savings rate, and it is related to the (solo) model because the saving rate is in this model. so if there is a policy, uh to increase the saving rate. you can illustrate the fact of the policy using this graph. and I mean in the framework of the (solo model). yeah and the second one is the allocating of the investment. and the assumption of that policy is there are many kinds of in-in-I mean many kinds of capital stock. which is not included in the solo model. so that policy is unrelated with this solo model. because in solo model we only have one kind of capital. which is k. yeah and the third one is to establish some institution, again that factor is not considered in the solo model. and the last one is the policy to promote the technology growth. and that policy will influence the value of g. so it will have a impact on the growth rate of output per worker and the total output so it is related to the solo model because that factor is included in this in this small g. so that’s all I want to talk about for this recitation. and (. ) good luck to your exam S1: ((speaks to IS19 in chinese))