邹恒甫学术论文集

宏观，财政，金融，增长

（第二卷）

邹恒甫／著

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邹恒甫，中国经济学第一人。中央财经大学、武汉大学、北京大学教授，世界银行研究部终身高级经济学家。两次获国家自然科学基金委员会杰出青年基金，首批社科长江教授，中组部首批千人计划教授。新中国首位哈佛大学经济学博士。著有《最后的狂人》等。

前 言

收集在《宏观，财政，金融，增长》三卷本里的论文是我与我的合作者二十年来发表的主要学术成果。我在哈佛大学读经济学硕士与博士时(1983—1989年)，自己从来没有想到要在国外学术期刊发表论文，因为我一直打算拿到博士就回武汉大学当老师。1989年，一个偶然的机会让我进了世界银行研究部，正像1983年一个偶然的机会让我去了哈佛大学，更像1977年一个偶然的机会让我上了武汉大学。在世界银行研究部，最主要的任务是发表论文和写各国经济调研报告。如此，我就被逼迫着写论文、发论文。现在看来，只要有压力，人人都能发表国际论文。说真的，越笨的人发表得越多，而越聪明的人越会去投机当社会经济政治各方面的混混，尤其是到中国同流合污地摸钱摸权摸女人。

这三卷论文涵盖了众多方面：地方财政的动态模型；政府开支的结构；政府税收的结构；中央政府与地方政府的财政关系；财政联邦制度；财政分权；财政开支与经济增长；多级政府的最优税收结构和转移支付；公共资本的提供；收入分配的历史与实现；收入分配与经济增长的关系；收入不平等的原因；资本主义精神与储蓄、增长和资产定价；资本主义精神与货币及增长；金融与增长及收入分配；社会地位与生产条件下的资产定价；腐败、增长与经济增长；开放经济的货币政策；国际收支平衡的短期模型；美元化与通货膨胀税；国际贸易、国际收支平衡与重商主义；重商主义与国家发展富强的历史与现实；外国援助与国际债务；外国援助与发展中国家的经济发展；军事开支，武器积累与经济发展的关系；武器与资本积累的确定性模型与随机模型等。这三卷论文还有众多对中国经济各方面的分析与经济体制的比较。

这些论文的共同点就是造反与标新立异。我从来就不愿意接受现有的结论，哪怕对效用函数只定义在消费上都绝对不能忍受，因为资产阶级的首要目的是积

累财富。我还为重商主义平反，为非生产性公共开支叫好。在新模型和实证分析的基础之上，我反对财政分权定理，反对外国援助会刺激穷国经济增长的共识，反对快速增长会减少贫富差别的老调，反对货币超中性定理等。

我特别强调，这三卷论文的许多理论与实证分析说明，发展中国家特别是中国在教育、卫生、社会保障、法治、社会治理等方面欠账太多。把巨额的政府开支用于基础设施还不如花在教育、医疗、养老保险和幼儿保险等方面。这些都有助于促进人力资本更优地形成。而人力资本远比投资“铁公基”的物质资本重要。如果中国政府在教育、医疗、社会保障各方面的政府支出都占到 GDP 的 6%，加起来就是 18%，那就跟中等发达国家的国际标准比较接近了。如果每一项都达到 GDP 的 8%，总计就是 24%，那就跟美国接近了。如果赶上北欧、西欧和加拿大，每项都达到 GDP 的 10% 以上，那中国就可以实现免费医疗、免费教育和免费社保了。这其实是一个民主的进程，也是发达国家在一百多年来“自发形成的秩序”（但愿哈耶克不要在墓地里气得发抖啊）。

在此我衷心地感谢我的众多论文合作者：没有他们最热心的帮助与最无私的奉献，这三卷论文的发表是不可能的。

这三卷论文集的编辑徐玲要我给大学生、研究生和博士生多谈点我自己怎么开始写论文的经历，我不妨在此试试。我本人认为，人在 20 岁至 30 岁之间是最有稀奇古怪想法的时候。我自己在 1987 年 25 岁时最喜欢狂想。

例如，在学习了 Cash-in-Advance Models 后，我马上写了一篇 Credit-in-Advance Model：信用越多，购买越方便甚至越多，而购买货物使用的现金（cash）就越少。但一个人信用多的基础是什么？当然是一个人所拥有的财富或资本。如此，通货膨胀率越高，大家用现金购买的货物越少，而大家都会多用信用卡购物，也就是说，大家会多积累财富或资本。这也是否定货币超中性定理的一个简单办法。我写的此文一直没有发表，但我自己还是得意的。后来我看了卢卡斯（Robert Lucas）和斯托基（Nancy Stokey）合写的一篇论文，把货物购买分成现金产品（cash goods）与信用产品（credit goods），我自然地意识到：名人的想法也被我想到了。哈哈。后来我的许多学生说他们的模型被名人都用过了。我听到后总是回答：“如果不是如此那就证明你太有才了！”

再举一例。在科尔奈（Janos Kornai）的短缺经济学里，他不厌其烦地唠叨计划经济中投资扩张与短缺严峻的周期关系。我很快给他写出了社会主义计划委员会选择投资率与短缺程度的动态最优化模型，并得出了投资率与短缺的周期微分方程的显示解。科尔奈教授看了我的文章，他问我是如何学会动态优化方法的。

我回答："就在研究生的课堂里学的。"后来，我意识到，年岁稍长的大数理经济学家往往也不学动态优化和动态规划，而他们仅仅停留在线性规划与非线性规划的水平上。这也是费尔德斯坦（Martin Feldstein）的毛病。

我还要回顾一下定义在消费和资本积累两个元素上的效用函数。当我写博士论文时，我把这种效用函数定义为我自己从 1978 年至 1982 年长期学习的马克思（Karl Marx）《资本论》的效用函数：资本家积累的目的主要是为积累而积累，消费不过是一个附带品。在哈佛学习经济学与数学的同时，我对韦伯（Max Weber）与桑巴特（Werner Sombart）等许多社会学家、历史学家也很痴迷，特别是关注他们关于新教伦理与资本主义起源抑或犹太教与资本主义起源的大争论。我同我的论文指导小组组长萨克斯（Jeffrey Sachs）讨论了这一博士论文的大致内容，他非常鼓励我并马上指出凯恩斯（John Maynard Keynes）《和约的经济后果》里关于资本主义本质的论述。萨克斯继续说道："用韦伯的资本主义精神模型还可以在美国卖得出去，用马克思的资本的本质模型只怕不好卖啊。"

我那时候很听话，把我的博士论文里的六篇论文合起来命名为《资本积累的一个新实证（positive）模型》。言外之意是说：所有只定义在消费上的效用函数基础上的增长模型是规范的（normative）、不合实际的、强加于人的和虚妄的东西。当我写作博士论文时，我开始注意到库尔茨（Mordecai Kurz）1968 年在《国际经济评论》（*International Economic Review*）上发表的资本财富效应模型，此模型认为社会主义计划委员会同样关注消费与资本积累。而在库尔茨之前，杜森贝里（James Duesenberry）在他 1948 年出版的博士论文里就把效用函数定义在消费、收入与财富三者之上！我很惊讶，无论自己如何疯狂地想象，我的确逃不出前人的魔掌。哈哈大笑。

1989 年 6 月 6 日我得到博士学位。之后，我的阅读更加广泛。首先，我看到了马加姆达（Mukul Majumdar）和米特拉（Tapan Mitra）在《经济理论》（*Economic Theory*）上发表的用离散动力系统方法得到的惊人结果：他们在库尔茨的模型里证明了周期和混沌的存在。接下来，我很快看到了巴克西（Gurdip Bakshi）与陈志武在《美国经济评论》上发表的资本主义精神和股市资产定价的好论文！

说到底，我似乎也极难把自己写论文的具体感受告诉大家。这其中味道只有《庄子》里讲得最好：

桓公读书于堂上，轮扁斫轮于堂下，释椎凿而上，问桓公曰："敢问公之所读者，何言邪？"公曰："圣人之言也。"曰："圣人在乎？"公曰："已死矣。"

曰："然则君之所读者，古人之糟粕已夫！"桓公曰："寡人读书，轮人安得议乎！有说则可，无说则死！"轮扁曰："臣也以臣之事观之。斫轮，徐则甘而不固，疾则苦而不入，不徐不疾，得之于手而应于心，口不能言，有数存乎其间。臣不能以喻臣之子，臣之子亦不能受之于臣，是以行年七十而老斫轮。古之人与其不可传也死矣，然则君之所读者，古人之糟粕已夫！"

伟大的萨缪尔森（Paul Samuelson）说过：一个人中断发表论文是在犯罪。他一辈子直到逝世还在写作、发表论文。但是，太多的中国经济学者与外国经济学者都过早地中断了他们的论文发表生涯。我希望学习了中级经济学的大学生、研究生和博士生看尽这三卷论文之糟粕，体会到庄子寓言的精妙，尽快地写出自己的好论文。如果有足够的压力，这是极容易做到的。邹恒甫都会发国际论文，哪个中国学生还不会呢？如果不搞"钱权色学"四位一体，那不知要发表多少新理论和论文啊！

邹恒甫

2013 年 7 月 11 日

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第 1 章

产品创新，资本积累和内生经济增长

Product Innovation, Capital Accumulation, and Endogenous Growth

Heng-fu Zou

Introduction

This chapter integrates both product innovation and physical capital accumulation in a simple model of endogenous growth and examines the long-run relationship between product development and capital formation. It also studies the impact of international technology transfers and international trade on long-run capital accumulation.

This work can be regarded as a continuation of the line of research initiated by Romer (1990), Grossman and Helpman (1991), and Helpman (1992). In the Romer model, the innovative products are horizontally differentiated capital goods and are produced from the homogeneous final output. These differentiated capital goods are in turn employed to produce the final output. A different modeling strategy is adopted by Grossman and Helpman. In the Grossman–Helpman model, the innovative products are intermediate inputs into the production of a single, final good. But the final good can be either consumed by households or can be invested in the form of capital accumulation by firms. In both models, a similar, perhaps surprising, conclusion has been drawn: physical capital accumulation plays only a supporting role in the story of long-run growth because the primary sources of growth are a variety of factors such as the rate of time preference, the productivity of product innovation, and the elasticity of substitution across brands, 'while the investment rate adjusts so as to keep the rate of expansion of conventional capital in line with the growth rate of output' (Helpman, 1992). Some related approaches to the dynamics of innovation and long-run growth can be found in Stokey (1988, 1991a, 1991b), Aghion and Howitt (1992), Gort and Klepper (1992), and Stein (1997).

In this chapter, we intend to offer a different perspective on capital accumulation, product innovation, and output growth. In particular, we hope to distinguish the role of the marginal productivity of capital in determining the long-run rates of both product innovation and physical capital accumulation. In our model, all differentiated goods are produced using capital input, and can be consumed, or invested to increase capital stock, or used for product innovation. This modeling option has already been pointed out in Grossman and Helpman (1991), even though they choose to model capital as the homogeneous final good.

We should not argue about the plausibility of treating capital stock as the accumulated differentiated products, because in the real world capital does take many forms such as machinery, buildings, tools, and so on. In modeling capital as differentiated goods, our model agrees with the Romer (1990) model, but it differs from the Romer model in assuming that the final consumption in our model also consists of all differentiated goods instead of a single, homogeneous good as in the Romer model.

In this alternative framework, we will demonstrate how the long-run growth rates of capital accumulation and product innovation are determined. In particular we will show the roles of the productivity of the capital stock and the efficiency of product innovation process in determining the long-run rates. In addition, we extend the basic model to an open economy and show that trade in goods not only improves welfare, but also accelerates capital accumulation. Furthermore, for a developing country receiving technology transfers from a developed country such as in the North-South model, the rate of capital accumulation in the South is shown to be partly determined by the rate of product innovation in the North.

This chapter is organized as follows. The next section will set up the dynamic model with both capital accumulation and product innovation. The growth rates of different variables will be derived. Following this, we consider the effect of technology transfers from the developed country on product innovation and capital accumulation in the developing country. The next section extends the model to the case with international trade and shows the impact of trade on capital accumulation. We then conclude this chapter.

The model

The consumer preference is the standard Dixit–Stiglitz CES utility function, which has been used by Krugman (1979), Judd (1985), and Grossman and Helpman (1991) among many others in studying the dynamic process of product innovation:

$$(4.1)\quad U = \int_0^\infty e^{-\rho t}\left(\int_0^\infty c(n,t)^\theta\, dn\right)dt,$$

where $c(n, t)$ is the rate of consuming good n at time t, ρ is the time discount rate, and $0 < \theta < 1$. Here θ has the usual economic implication that the elasticity of substitution between any two goods is $(1 - \theta)^{-1}$.

At any time t, the available variety of goods in this economy is given by $[0, N(t)]$. New product can be obtained through costly product development:

$$(4.2)\quad \dot{N}(t) = R^\alpha,$$

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where R is the spending on product development, and $0 < \alpha < 1$. Obviously, α measures the efficiency level of product innovation as a higher value of α yields more new variety with the same input R than a lower value of α.

The production functions for all goods are identical:

$$(4.3) \quad x(n,t) = \beta k(n,t),$$

where $x(n, t)$ is the output of good n at time t, $k(n, t)$ is the capital input to produce good n at time t, and β is the marginal productivity of capital at time t. In the context of endogenous growth, this constant return production function specified in (4.3) has been quite popular, see Barro (1990) and Rebelo (1991) for the arguments.

At time t, the total capital stock is given by $K(t)$:

$$(4.4) \quad K(t) = \int_0^{\infty} k(n,t)dn = \int_0^{N} k(n,t)dn .$$

In our model, both physical investment and product development utilize differentiated goods. For simplicity, we assume that all differentiated goods are perfect substitutes for these two purposes, even though they are imperfect substitutes in consumption. Since the utility function is symmetric in the variety of goods and since the marginal utility of each good is diminishing, the optimal consumption of each good at time t is the same: $c(n, t) = C(t)$ for all $n \subseteq [0, N]$. Thus we can write the discounted utility in (4.1) as

$$(4.1') \quad U = \int_0^{\infty} e^{-\rho t} N(t)C(t)^{\theta} dt .$$

Furthermore, due to identical consumption for each good and identical production function in (4.3), and due to the perfect substitutability across goods in physical investment and product development, the optimal output of each good at time t is also the same: $X(t) = x(n, t)$ for $n \subseteq [0, N]$ and

$$(4.3') \quad X(t) = \beta K(t) / N(t).$$

Therefore, all products that are not consumed can be either used for investment or for product development:

$$\dot{K}(t) = \int_0^{N} x(n,t)dn - \int_0^{N} c(n,t)dn - R - \delta K,$$

here δ is the rate of capital depreciation. Upon substituting $x(n, t) = X(t)$ and $c(n, t) = C(t)$ for all $n \subseteq [0, N]$

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(4.5) $\dot{K}(t) = \beta K(t) - N(t)C(t) - R(t) - \delta K(t).$

Equation (4.5) says that the aggregate output is allocated among consumption, product innovation, the replacement of the depreciated capital, and new capital formation.

The optimization problem is to maximize (4.1') subject to the two dynamic constraints (4.5) and (4.2) with the initial values $K(0)$ and $N(0)$ given.

The current value Hamiltonian is:

(4.6)
$$H(K, C, N, R, \lambda, \omega) = N(t)C(t)^{\theta} + \lambda[\beta K(t) - N(t)C(t) - R(t) - \delta K(t)] + \omega R(t)^{\alpha}$$

where $\lambda(t)$ is the shadow price of capital, and $\omega(t)$ is the shadow price of product variety.

The first-order conditions necessary for optimization are:

(4.7) $\theta C(t)^{\theta-1} = \lambda(t),$

(4.8) $\alpha\omega(t)R(t)^{\alpha-1} = \lambda(t),$

(4.9) $(\beta - \delta - \rho) = -\dot{\lambda}(t)/\lambda(t),$

(4.10) $C(t)^{\theta} - \lambda(t)C(t) = \omega(t)\rho - \dot{\omega}(t),$

(4.11) $\dot{K}(t) = \beta K(t) - N(t)C(t) - R(t) - \delta K(t),$

(4.12) $\dot{N}(t) = R^{\alpha},$

and the transversality conditions:

$$\lim_{t \to \infty} \lambda(t)K(t)e^{-\rho t} = 0, \lim_{t \to \infty} \omega(t)N(t)e^{-\rho t} = 0.$$

Equation (4.7) implies that the marginal utility of consumption for every product and the shadow price of capital are equalized at all time. Equation (4.8) indicates that the allocation of resource for capital formation and product innovation is guided by the equality of their shadow price ratio to their marginal cost ratio: $\lambda(t)/\omega(t) = \alpha R^{1-\alpha}$. Equations (4.9) and (4.10) are the Euler conditions for the shadow prices of capital and innovation, respectively. Equation (4.11) restates the dynamic budget constraint (4.5), and equation (4.12) restates the technology generating new product variety, namely, equation (4.2).

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