Pharmacogenomics: Impact on Health Care Justice

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Introduction

Pharmacogenomics is receiving a great deal of attention in scientific circles and, increasingly, in the popular press because of the promise of personalized medicine. There is great hope that this new pharmaceutical product will be developed to decrease adverse drug reactions and improve the treatment of many serious diseases. Although pharmacogenomics promises dramatic improvement in drug safety and efficacy, the field also raises a host of ethical questions\(^1\). This paper discusses the relation between pharmacogenomics and health care justice.

Norman Daniels, building on the work of John Rawls, has been writing about his theory of justice for health care for almost three decades. In his ideal theory\(^2\), Daniels takes medical institutions as institutions that provide fair equality of opportunity. From an economic perspective, the health care system can be viewed as a ‘production function’ in which many inputs are combined through some process to produce certain outputs or ‘health outcomes’. Daniels focuses on fair deliberative process as a mean to reach distributive justice and overlooks other variables that might frustrate the objectives of justice. In this paper I would address the economic aspect of pharmacogenomics and its effects on healthcare justice. Issues of justice are raised by the business of producing drugs and medical devices. Does the for-profit business of bio-medicine promote justice in meeting medical need? What kind of role do pharmaceutical companies play in existing theories of justice? Don’t we individuals have duties of justice? Those are questions to be discussed in this paper.

My paper has the following structure. First, distinguishing between health care

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1 See, for instance, 2002 issue of the Kennedy Institute of Ethics Journal, article by Allen Buchanan, Andrea Califano, Jeffrey Kahn, Elizabeth McPherson, John Robertson, and Baruch Brody. They proposed that the ethical issues raised by pharmacogenomics can be addressed under six heading: (1) regulatory oversight, (2) confidentiality and privacy, (3) informed consent, (4) availability of drugs, (5) access, and (6) clinicians’ changing responsibilities in the era of pharmacogenetics medicine.

2 John Rawls explicitly defined his work as ideal theory. Since Daniels articulates ingeniously Rawls theory into a theory of justice for health care, his theory can be categorized as “ideal” one. Ingrid Robeyns further claims ideal theory can be comprehensive or partial. And partial ideal theory can be partial in 3 ways. Health care justice is the second way Robeyns classifies to be focusing on one domain of justice.
justice and other ethical issues raised by pharmacogenomics, I discuss the economic effect of this new technology and relation between pharmaceutical companies, regulators and health care justice. Second, taking pharmacogenomics as testing case, I examine, in Sen’s words, how transcendental institutionalism and realization-focused understanding of justice might explain the position of powerful for-profit business in health care justice. The last section of the paper urges two-way relation, given the behavioral parameters in a society, between behavior on grounds of social justice and the institutional need to advance the pursuit of social justice. Because taking nonideal circumstances seriously, we have to pay attention to the demands that justice makes on us as individuals.

**Pharmacogenomics and Its Ethical Issues**

**I. Terminology and History**

The word *pharmacogenetics* is derived from ‘pharmacology’ and ‘genetics’, and has traditionally been defined as: ‘genetically determined variability in drug response’ \(^3\). For over fifty years the term remained uncontroversial, with little dispute over what people meant when they spoke of pharmacogenetic reaction to a drug.

Depending on one’s source, pharmacogenetics was either founded by Pythagoras, with his observation of adverse reactions to fava beans in 510 BC \(^4\) or Freud, with his discovery in 1885 that different people have different pharmacological reactions to cocaine \(^5\). The term *Pharmacogenetics* itself was coined by Friedrich Vogel in 1959, following groundbreaking work by Arno Motulsky two years earlier. At the core of pharmacogenetics is the idea that humans differ one from another in their reaction to drugs. Individuals may differ in the way in which they metabolise drugs, the way in which the drugs actually operate within their bodies, and the rates and extent to which products are removed. The result of these variations mean that some people metabolise a standard dose of a drug so fast that they do not gain any therapeutic benefit from it; others who are slow metabolisers run the risk of adverse drug reaction (ADR)s and have to be prescribed much lower does of particular drugs.

In 1997 a new word appeared in the literature—*Pharmacogenomics*. Although two terms are synonymous for all practical purposes, pharmacogenomics uses

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genome-wide approaches to elucidate the inherited basis of differences between persons in the response to drugs. Nevertheless, surrounding discussions of pharmacogenetics are less technical, perhaps more publicly acceptable terms; ‘tailor-made treatments’, and, of course, personalized medicine.

Much closer to near-term application is the use of information about how genetic variations affect the efficacy of drug to guide prescribing decisions for agents current on market. In August 2007, FDA deemed that the accumulation of pharmacogenomic information was sufficient to warrant a modification in the labeling of warfarin to highlight the potential relevance of genetic information to prescribing decisions.

II. Ethical Issues

According to FDA, more than two million serious ADRs take place every year, and these account for more than 100,000 deaths annually among hospitalized patients in the United States alone. Besides, adverse reactions to drugs rank as one of the leading causes of death and illness in the developed world. Therefore, Eliminating, or at least reducing, ADRs is one of the primary goals of those pursuing what commonly referred to as ‘personalised medicine’. The idea behind personalized medicine is simple. Rather than accepting the ‘one-size-for-all’ approach of ordinary drug therapy – where dosage is the only primary variant from patient to patient—researchers envision that medications would be tailored to fit the profile, especially the genetic profile, of each individual patient.

As Emilio Mordini writes, ‘at a time when harmful drug reactions are thought to rank just after strokes as a leading cause of death in the U.S., the potential benefits of tailoring drug to a patient’s genetic makeup should not be underestimated even from an ethical point of view.’ As with many new technologies, pharmacogenomics is a field plagued by ethical concerns. These pertain first to the need to protect informed consent and confidentiality. Additionally, question of justice and equity of access bedevil the field of pharmacogenomics, especially in terms of the distribution of its burdens and benefits nationally and globally.

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7 Susan B. Shurin and Elizabeth G. Nabel, ‘Pharmacogenomics—Ready for prime Time?’, N ENGL J MED 358;10, March 6, 2008, p.1061.
This paper focuses on the ethical questions vis-à-vis pharmacogenomics falling into the category of justice – particularly distributive justice, which demands that the burdens and benefits of these new technologies be shared in an equitable fashion. The idea that someone or some group would enjoy significantly less access to medical treatment simply by virtue of race or economic status, or even by virtue of their draw in the genetic lottery, violates a deep-seated sense of fairness.

Pharmacogenomics and distributive justice

1. ‘Orphan’ genotype subgroup

The increase in knowledge of how genotype variations affect drug response may identify genotype subgroups that carry higher than average likelihood of nonresponse or side effects. If the group of nonresponders is too small, pharmaceutical companies might not find it economically attractive to try to develop an alternative drug for that population. Persons who are in such “orphan” genotype subgroup will lack access to effective medications. These inequalities in access to health care often coexist with deep inequalities in health status; certain racial/ethnic minorities and the poor are in worse health status; drugs have not developed for them.

An “orphan” population may have a genotype leading to a condition for which there is currently no effective therapy; or, such a population may have been defined—for market purposes—by the pharmaceutical industry as too small to be attractive as a drug market11. Furthermore, real problem will exist for those who end up genetically categorized as ‘difficult to treat’ or as ‘nonresponders’ to a given drug therapy. These individuals may then have ‘preexisting condition’ problem that could affect their ability to obtain adequate access to health care. Following I would exploit what Adam Swift distinguishes between ‘epistemological’ and ‘practical’ conception of options for ameliorating the problem of ‘orphan’ groups of nonresponders.

(i) Epistemological option

Norman Daniels, building on the work of John Rawls, has been writing about his theory of justice for health care for almost three decades. Since John Rawls explicitly defined his work as ideal theory, Daniels’s theory is deservedly to be established as ideal and perfect justice. Like Adam Swift mentioned that the goal of perfect or ideal justice would be rather to know or understand something about justice

than to motivate action toward it. Daniels’s epistemological suggestion would be comparatively abstract.

Maintaining normal functioning by meeting health needs is to what Daniels limits the application of justice. Because persons among ‘orphan’ genotype subgroup are below normal species functioning, their health needs ought be met fairly and accordingly. Now the problem turns to how to allocate the limited resources fairly. Such dispute is matter of distributive justice. Daniels organized the dimensions of fairness in health care into ten benchmarks. The ten benchmarks for fairness is analytic, not justificatory. Daniels believe that it helps us locate points of disagreement and agreement and facilitate discussion of what features produce fairness even where there is both moral and empirical disagreement. It is intended to put issues of fairness on the table and to force constructive dialogue about them.

After the conception of ten benchmarks, Daniels keeps searching for fine-grained distributive principles. He proposes ‘accountability for reasonableness’ to help solve the legitimacy and fairness problem by placing public agencies and even private health plans visibly in that role. And there is an assumption that the so-called ‘fair-minded’ people exist to seek reasons (rules) they can accept as relevant to meet health need fairly under resource constrains. Four conditions make more precise the notion of accountability for reasonableness: 1. Publicity Condition, 2. Relevance Condition, 3. Revision and Appeals Condition, 4. Regulative Condition. Here, Daniels attempts to bring decision making about meeting health needs out of a mysterious box together with the four conditions. Take the ‘orphan’ genotype subgroup for example, Daniels believe the four condition would make it possible to access health plan and public agency decision in the light of wider societal views about fairness. No matter ten benchmarks or accountability for reasonableness, none of them propose a guiding action toward the problem of ‘orphan’ groups of nonresponders.

(ii) Practical option

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13 Norman Daniels, Donald W. Light and Ronald L. Caplan, Benchmarks of Fairness for Health Care Reform, Oxford University Press, 2006, pp.31-69.
14 By fair-minded people, Daniels means ‘people who seek to cooperate with others on terms they can justify to each other. They also search for mutually acceptable rules narrows the scope of disagreement and provide the ground on which disputes can be adjudicated.
16 Ibid.
The first option is to rely on the existing orphan drug law, which encourages pharmaceutical companies to develop drugs for relatively rare diseases by extending year period of patent of top selling drug. The second option is to shape NIH and other public or private grand priorities so as to subsidize research to develop drugs for orphan genotypic subgroup or orphan diseases.

II. Ancillary Disease risk information from PGx Tests

The study of genetic determinants of drug response began more than 50 years ago, the completion of the Human Genome Project has made possible to envision the common use of pharmacogenetic testing to individualize drug therapy. Some researchers are optimistic about this new technology and therefore believe that pharmacogenetics may become one of the first widespread clinical uses of genetic information in health care\textsuperscript{17}.

Ancillary risk information represents an unintended consequence of tests performed to improve health care by predicting drug response, adverse events, and dosage requirements. A research report indicates that some variants very likely will provide ancillary disease risk information. The testing of asymptomatic persons for future health problems sometimes is known as susceptibility testing. Like non-genetic information, genetic data can be used to provide opportunities for early or preventive treatment. Here comes the issue: whether “future disease problem” is the disease that Norman Daniel regards reducing our fair equality of opportunity and thus need be remedied? Or falls within the sphere of natural lottery? How personalized medicine would be a revolution in health care? Each encounters theoretical and practical difficulties of allocating, rationing and setting priorities.

(i) Epistemological view

To present Daniels’s argument for this issue, I would like to illustrate his four levels of layers of health-care institutions as following\textsuperscript{18}.

<table>
<thead>
<tr>
<th>First layer:</th>
<th>Preventive health-care institutions can be viewed as a first defense of the idealization. They act to minimize the likelihood of departures from the normality assumption. Included here are institutions which provide for public health, environmental cleanliness, preventive personal medicine services, occupational health and safety……We might think of these institutions as keeping us close to the less</th>
</tr>
</thead>
</table>

\textsuperscript{17} NB Henrikson, W Burke and DL Veenstra, ‘Ancillary risk information and pharmacogenetic tests: social and policy implications’, \textit{The Pharmacogenomics Journal}, 2008:8, p.85.

controversial, simplified core of our theory, for we have not yet had to correct for departures from normality.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second layer</td>
<td>We need a second layer of institutions which corrects for departures from the idealization. These institutions deliver personal medical and rehabilitative services that restore normal function.</td>
</tr>
<tr>
<td>Third layer</td>
<td>Third layer of institutions is involved with more extended medical and social services for the chronically ill and disable and the frail elderly.</td>
</tr>
<tr>
<td>Fourth layer</td>
<td>A fourth layer of institutions involves health care and related social services for those who are in no way be brought closer to the idealization.</td>
</tr>
</tbody>
</table>

Though Daniels urges that the layers should not be taken to imply to be ranked in moral priority, he still proposes vaguely that it is preferable to prevent than have to cure, and to cure than have to compensate for lost functioning. How the ancillary disease risk information predicted by PGx test could fit the fourth layer of institutions well that would affect allocating, rationing and setting priorities of the ‘future disease’ problem accordingly. I would firstly distinguish 1. PGx test, 2. Preventive treatment.

<table>
<thead>
<tr>
<th>Layers of Institution</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-Preventive Layer</td>
<td>1. PGx Test &lt;br&gt;2. Preventive Treatment</td>
<td>1. PGx Test</td>
</tr>
<tr>
<td>Second- Rehabilitative Layer</td>
<td></td>
<td>2. Preventive Treatment</td>
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<tr>
<td>Third- Compensative Layer</td>
<td></td>
<td></td>
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<tr>
<td>Fourth-Social Service Layer</td>
<td></td>
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</tbody>
</table>

This would be a practical question for Daniels’s ideal theory once is applied to our nonideal circumstance. The pressing question would be the identification for the preventive treatment which has both features of ‘preventive’ and ‘rehabilitative’. The identification would affect the allocating, rationing and setting priorities accordingly.

(ii) Practical view

No matter the ‘preexisting condition’ problem or the ‘future disease’ problem raised by pharmacogenomics, both of them ultimately fall into the category of distributive justice. From Daniels’s epistemological viewpoint, he, like John Rawls, rather treats the institutions as themselves manifestations of justice than seek institutions that promote justice. Also, Daniels believes that if we don’t have no consensus on principles of capable of resolving disputes about resource allocation for health and health care, then we must find a fair process whose outcomes we can
accept as just or fair\textsuperscript{19}. Although he discusses the components of fair process including fine-grained distributive principles, market accountability or the public attitude, he insists that they don’t substitute for the fair process. Like John Ralws, Daniels also views the whole social contract construction that leads to the selection of the principles as an example of procedural justice\textsuperscript{20}.

Similar to ‘orphan’ genotypic subgroup problem, the practical option for ‘future disease’ problem would involve the stakeholders including government, private sector and pharmaceutical drug companies etc. The epistemological view proposed by Daniels mainly imposes an obligation on government and overlook healthcare is provided primarily by non-governmental agents, many of which are for-profit entities like pharmaceutical companies, for-profit hospitals or for-profit medical providers. Though he asserts that making systems more efficient will contribute to their fairness overall\textsuperscript{21}, Daniels overlooks to scrutinize the significant parameter influencing the efficiency of health care system, that is pharmaceutical company.

**Pharmacogenomics and a Broader View of Health Care Justice**

Adverse reaction to drugs rank as one of the leading causes of death and illness in the developed world\textsuperscript{22}. Therefore, cost avoided by substantial reduction in adverse drug events should be realized as a benefit of pharmacogenomics-based therapies. As for its impact to pharmaceutical companies, by targeting patient subgroups, the number of people needed to conduct clinical trials will decrease, thus reducing trial times and cost\textsuperscript{23}. According to one estimate, pharmacogenomics could save up to 45% of clinical drug development cost\textsuperscript{24}. Even though, in light of recent experience with biotechnology-derived products, it is widely anticipated that pharmacogenomics drugs will be more expensive than traditional modes of treatment. And the resultant premium pricing of drugs may mean that those who are economically worse-off also will have less access to these new therapies\textsuperscript{25}.

\textsuperscript{20} Ibid. ‘The fair process I seek will turn out to be pure as long as we have no consensus on fine-grained distributive principles’
\textsuperscript{21} Ibid., p. 105.
Daniels mentions that with lower init prices, a more efficient system could better meet health needs per dollar spent. And to make systems more efficient will contribute to their fairness overall thus promote justice in meeting health need. Nevertheless there is no or not sufficient discussion in his theory to elucidate the significant part of for-profit business during delivering medical services. Next section we turn to explore the economic aspect of Pharmacogenomics and suggest that business ethics could be the important factor to promote health care justice.

I. Justice and Market in Healthcare

(i) Macro-economic dimension of health care

In industrialized nations increases in healthcare spending continue to outpace inflation. In 2006 national health expenditures (NHE) rose 6.7% in United Sates, accounting for 16% of gross domestic product (GDP)\(^\text{26}\). The problem is common to all members of the Organization for Economic Co-operation and Development (OECD). The average, annual, per capita increase in health spending for all OECD countries was 4% in the period from 1995 to 2005. Additionally, average OECD healthcare expenditure as a share of GDP reached 9% in 2005.

In U.S. healthcare spending on pharmaceuticals alone has reached $200.7 billion, a nearly 500% increase since 1990. This account for 10% of NHE in 2005. On average, per capita spending on pharmaceuticals for OECD countries has risen by more than 50% in real terms since 1995. Pharmaceutical spending constituted around 17% of NHE for OECD countries and growth in spending between 1995 and 2005 has averaged 4.6% per year.

(ii) Industry –R&D

Industry’s intense interest in pharmacogenomics, dating from around 1997, but it has stimulated considerable investment on the part of pharmaceutical companies. One estimate suggests that somewhere between 10 and 20 per cent of big pharmaceutical company R&D budgets are now directed towards genomics. In terms of individual firms, Roche, one of the industry leaders in pharmacogenomics, claims to invest about 5 percent of its total R&D budget in these techniques\(^\text{27}\). Due to the high cost of drug development, industry executives are keen to adopt any technology


that will reduce their R&D expenditure.

(iii) Industry—Marketing

One of the primary means by which the pharmaceutical industry maintains high profit margins is through their immense investment in marketing. Take U.S. for example, nearly $30 billion in 2005, of this amount $6.7 billion was spent on direct-to-physician (DTP) marketing. If one includes medical journal advertising and free drug samples, the total amount spent on marketing to American physicians comes to $25.6 billion\(^{28}\).

In 1997 the US Food and Drug Administration (FDA) altered its policy on direct-to-consumer (DTC) advertising in such a way as to make it possible for widespread use of television commercials for prescription pharmaceutical advertising. Unsurprisingly, spending on DTC advertising has also been increasing. In 2006 $4.74 billion was spent in US on DTC advertising, up over 6 times the $760 million spent in 1997\(^ {29}\). One recent study points out that in1996 pharmaceutical industry spending on professional promotion, or direct-to-physician (DTP) marketing was 4.4 times that of DTC marketing. In 2005 spending on DTP marketing was only 1.7 times more than spending on DTC marketing\(^ {30}\). At the same time, the pharmaceutical industry is lobbying the European Union to lift its restrict ban on marketing to patient regarding drug\(^ {31}\).

Would personalized medicine drive DTC advertising cost higher and higher? Though the pharmaceutical industry consistently denies that DTC advertising raises the price of prescription pharmaceutical, it is not unreasonable to think that a significant portion of the cost of DTC advertising is passed on to consumers via higher drug prices.

(iv) Industry – Patent

Monopoly powers, such as those commanded by drug companies holding patents, allow sellers to gain higher prices than ideal competition would allow. In response to this problem, developing countries like Thailand and India has begun to overrule international patents on several drugs and churn out cheap generic copies\(^ {32}\).


\(^{29}\) Ibid. p.132.

\(^{30}\) Ibid. p.133.

\(^{31}\) Ibid.

\(^{32}\) Under a provision of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), countries can “compulsorily license” certain drug, but only under special conditions, which it is not clear that Thai has met. It is not clear that this will be an effective long-term strategy. With companies feeling the financial impact from the proliferation of cheap generics combined with even
(v) summary

Norman Daniels infer the social obligations o protect opportunity through the promotion of normal functioning mean that health inequalities should be viewed as unjust if the result from an unjust distribution of the determinants of health. His theory of health care justice mainly focuses on distributing the key social determinants of health according to Rawls’s principles of justice. He further divide resources allocation decisions to various levels within a system, a political “macro” decision determines the overall share of the public budget to be devoted to healthcare, “meso” decisions must be made at regional, health authority, or hospital levels and finally “micro” decisions may be made about the resources to be devoted to specific, identified patients. All the decisions must be made according to Rawls’s principle. However, except for fair distributive procedure, the purely institutional view of justice overlooks other important factors which affect the anticipated results significantly.

Instead of, in Amartya Sen’s term, transcendental institutionalism—including John Rawls’s theory of justice as fairness—I use notions of comparative justice to approach a more just society rather than a perfect just society. Sen takes famine and poverty for example to explain that analysis of both issue cannot be dissociated from pragmatic consideration, particularly informational availability. Here, I would like to propose that to broaden informational focal point rather than only to shift it can make the issue of health care justice a radical difference. In the paper, I take Pharmacogenomics as a starting point to review two informational focal points, one is for-profit business and the other is citizens. If we view the distributive justice of health care as a “production function”, the framework would be:

![Diagram of Input, Process, and Output]

II. Business ethics

In Daniels’s Broken Promises, he does not explore the issue of justice raised by
the pharmaceutical companies but examines 5 promises broken by the business of producing drugs and medical services. The 1\textsuperscript{st} promise is that the competition brings low unit prices. The 2\textsuperscript{nd} is that managed competition will control cost increases. The 3\textsuperscript{rd} is that consumer-driven health plan will both lower costs and lead to wiser health purchasing. The 4\textsuperscript{th} is that the promise that competition among private plans delivering the Medicare drug benefit will control costs and improve access to drugs. The 5\textsuperscript{th} is that market-friendly reforms, such as user-fees and privatization, will improve sustainability and efficiency in developing country systems.

Daniels examines 5 market-friendly strategies adopted by health care system and concludes 5 of them are broken. Daniels suggests his benchmarks of fairness to make business of medicine more conductive to both of our health and to the requirements of justice. Benchmarks of fairness ensure the process to achieve the desirable equity, which is still the focal point of fair process not to shift to other focal point at all. Besides, what if we shift the question ‘Does the market-friendly strategy promote justice in meeting medical need?’ to ‘Does business have a responsibility to promote justice in meeting medical needs?’ Doing this we are going to review the issue of health care justice from different informational focus – business ethics.

(i) Negative Duty View

Along the lines of John Rawls’s duty of assistance in his The Law of Peoples, Nien-he Hsieh explore that MNE (multinational enterprise) do not have positive duty to promote just institutions but have a responsibility to promote minimally just background institutions which is grounded in a negative duty of not to do harm\textsuperscript{33}.

(ii) Corporate Citizenship

Corporate Citizenship (CC) is proposed by Neron and Norman by addressing the question “whether the language of ‘citizenship’ is helpful for thinking about and justifying corporate responsibilities” in democratic market society\textsuperscript{34}. One of the most important criticism of Neron and Norman’s work is from Van Oosterhout for two reasons: First. The legal metaphor of corporate citizenship mistakenly links organizational compliance to citizenship consideration. Second. The citizenship connotation wrongly suggests that business organizations, like natural persons, are to be positioned as compliance subjects, while groundbreaking contemporary scholarship conceives of business organizations instead as part of the institutional matrix that facilitate and enforce compliance by natural persons. In so far as this


emerging view connects to citizenship at all, it understands corporations to be more like governments than like citizens\(^{35}\).

### III. Impartial Inspector

To enrich the judgment of health care justice in pluralist way, impartial inspector is the next informational focus being explored. The notion of ‘impartial inspector’ come from Adam Smith and is applied by Amartya Sen to make analogy of making room to listen to voices outside the perspectives of the negotiating protagonists., which help us to achieve a fuller- and fairer-understanding\(^{36}\).

**Re-embedding Market: Enlightenment from Pharmacogenomics**

Karl Polanyi’s seminal critique of the devastating effects of ‘disembedding’ at the hands of so-called self-regulated markets. In The Great Transformation, Polanyi argues that ‘the control of the economic system by the market is of overwhelming consequence to the whole organization of society: it means no less than the running of society as an adjunct to the market. Instead of economy being embedded in social relations, social relations are embedded in the economic system’.

Although forms of trade and exchange can be found in all human societies, economic exchange had never previously been so independent of all other relations. Maybe the 5 broken promises Daniels proposes is just the tip of iceberg for what Karl Polanyi has caution us against the ‘disembedding’ of market from broafer social and political system\(^ {37}\). Nowadays, we might not be able to deem the subordinative relation between market and social/ political system still exists. The interplay between those system is the scenario we see in contemporary world. Therefore, the ‘disembedding ’ of market system might be reinterpreted as disembedding from human society that was previously integrated by core value. We might illustrate the idea as following:

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\(^{37}\) Instead of the historically normal pattern of subordinating the economy to society, their system of self-regulating markets required subordinating society to the logic of the market: He writes in Part One: “Ultimately that is why the control of the economic system by the market is of overwhelming consequence to the whole organization of society: it means no less than the running of society as an adjunct to the market. Instead of economy being embedded in social relations, social relations are embedded in the economic system?” Yet this and similar passages lend themselves to a misreading of Polanyi’s argument. Polanyi is often mistakenly understood to be saying that with the rise of capitalism in the nineteenth century, the economy was successfully disembedded from society and came to dominate it.”
Back to our starting point-pharmacogenomics, from the examination of Norman Daniels’s theory of health care justice, I find his information focus stay in the process to achieve fairness. I therefore broaden them in two aspects, one is business ethics the other is impartial inspectors. The hint or evidence we find in exploring the impact to health care justice caused by pharmacogenetics is the disembedding of market. My work is not finished and it would be continuing to discover if the interplay between policy maker, business ethics and impartial inspectors would be the way to have market system re-embedded to human society.