

JESSE VORST, UNIVERSITY OF MANITOBA

**Jan Tinbergen, Nobel Laureate**  
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**Introduction**

I felt the existing inequalities among people as an injustice but was told it was something that could not be removed without a better knowledge of the structure of society.

The Great Depression, some years after, reinforced my conviction that economic research might be more useful than physical research.<sup>2</sup>

These statements describe the life and work of Jan Tinbergen, the greatest economist to ever come out of The Netherlands. Tinbergen did not accept inequality as a fundamental aspect of our social structure but realised, as an academic, that some of it was necessary for the optimal functioning of the economy. A thorough understanding of the workings of the economy was necessary to resolve the conflict between equality and efficiency (as we now call it). And although Tinbergen would make contributions in many areas of the economics discipline, he never abandoned his search for social justice nor gave way to the comfort of abstract theorising.

Jan Tinbergen was born in The Hague on April 12, 1903 into a teachers' family. Being gifted in the exact sciences, he studied physics at Leiden. One of his professors was Paul Ehrenfest, renowned for his work in the field of statistical mechanics.

Leiden, in those days, was developing into a university with a strong social constituency, even though it was still a centre of Dutch establishment thinking. In due course there would be a pacifist presence — from which then-princess Juliana would develop her pacifist-socialist thinking.

At the suggestion of his mailman, the young student Tinbergen toured working-class Leiden and was quite horrified by the squalor and appalling conditions — conditions resembling those of Dickens'

nineteenth-century industrial England. He joined the Labour Party<sup>3</sup> in 1923 and would forever remain a member.

Upon completion of his doctoral course work in 1926 he started work at the Dutch Central Bureau of Statistics, not as a regular staff member but as a conscientious objector refusing military service. While his first project was mainly technical (on mathematical-statistical methods for business-cycle research), his social interests soon found expression in a report entitled "Rotation within the Army of the Unemployed" (on the measurement of levels and time-structure of unemployment). In 1929 he obtained his doctorate in mathematics and physics on a thesis titled "Minimum Problems in Physics and Economics". I may note that the use of mathematics in economics had found some acceptance within the economics profession; most of the methodology, though, had not been developed by economists for their discipline.

Jan Tinbergen joined the CBS in 1929 as a regular staff member, specialising in research on "production cycles". His ascent was quite meteoric: private university teacher at the University of Amsterdam in 1931, professor at the (then) Netherlands School of Economics in 1933. Particularly the latter appointment is of major interest. The NSE was still run by the Rotterdam business and harbour establishment that had founded the school in 1913. Such a noted scholar as Joseph Schumpeter (who would eventually accept a position at Harvard and produce there his *History of Economic Analysis*, the most authoritative survey of its kind) was not deemed worthy of an appointment when he had to flee his native Austria. That the young radical Tinbergen found a place there was quite astonishing.

His acceptance into the ranks of Dutch economists was also shown by his election to the governing body of the national professional association, the *Vereeniging voor de Staathuishoudkunde*,<sup>4</sup> which he had joined in 1929

and to which he would deliver no less than five principal addresses.<sup>5</sup>

Jan Tinbergen's professional life would take on many different forms over the next 60 years. He belonged to the Labour think-tank that produced the famous Labour Plan<sup>6</sup> in 1935, outlining the structure of a social-democratic planned economy<sup>7</sup> anticipating Keynes' *General Theory* which would shock the economics establishment in 1936. It recommended active government intervention in the economy in order to return the system to stable full employment. He was the natural choice as first director of the Central Planning Bureau, set up after the war as the principal government advisory and research agency in matters of the economy. In 1955 he left the CPB and converted his professorship at the NSE into a full-time position — extracting the promise that he would be exempted from serving as rector magnificus, as he knew his expertise was needed more in teaching and research than in matters of administration.

In 1969 the first Nobel Prize in Economics would be bestowed on Jan Tinbergen and Norway's Ragnar Frisch "for having developed and applied dynamic models for the analysis of economic processes". It was no coincidence that both were not only early practitioners of econometrics (the intersection between economics, mathematics and statistics) but also prominent intellectuals of the European Left. Indeed, Frisch and Tinbergen, together with several other economists of Northern and Western Europe, played major roles in the design of post-war Europe and the social-democratic platform on which the modern welfare state was built.

Tinbergen's retirement from the NSE in 1973 coincided with the expansion of the school to a full-fledged university, named after the illustrious Erasmus. The official event's highlight came when Queen Juliana personally presented him with the House of Orange Medal For Drive and Ingenuity, an award that is not only exclusive but is given only at the monarch's personal initiative.

As professor emeritus Tinbergen kept on writing, lecturing and advising. At the time of his death at age 91 the number of his scholarly books and articles was estimated to be well over nine hundred; a precise count is still not available as Tinbergen published far and wide, in many countries and languages.

There is hardly any part of the economics discipline that has not been touched by Jan Tinbergen. Pieter de Wolff and Jacob Kol (the former a colleague of Tinbergen and his successor as director of the CPB, the latter a pupil and junior colleague) provide the following breakdown:<sup>8</sup>

- economic dynamics and business cycles
- economic policy: theory and models
- international economics and economic integration
- economic development
- income distribution
- the economic order

to which list should be added "economic and political peace and security". I shall try to illuminate some of the highlights of this enormous oeuvre.

### Tinbergen's approach to science

Tinbergen insisted that only objective science would allow for "differences of opinion [to be] formulated in a more noble way than merely as conflicts". Science depends on and should lead to understanding and tolerance. In contrast with the mostly verbal form of economics, with the occasional throwing-in of a graph or table, that was practiced before the era of econometrics (and, indeed, well into it), measurement was to become the core of scholarly analysis. But measurement alone is not sufficient. The measured phenomena must be placed in the context of a mathematical-statistical model,<sup>9</sup> identifying interactions among the many factors (variables) playing a role in the economy. Technically, an econometric model consists of a number of mathematical equations of which the coefficients have been estimated and tested for statistical significance.<sup>10</sup> Tinbergen did not deny that understanding of the economic process and even the making of accurate predictions is possible on the basis of intuition. Such, however, was only the prerogative of the genius. Ordinary mortals and simpler souls would have to rely on measurement.

Experiment was essential for successful model building. Tinbergen "played" endlessly with different specifications of equations, in terms of variables to be included or excluded, mathematical shapes (linear, logarithms, finite differences, etc.) and time structures (current and lagged variables as explanatory factors of today's observations).<sup>11</sup> He borrowed heavily and

freely from other disciplines, including sociology, psychology and political science. Cross-fertilisation was essential in the development of successful methodologies. Several of his books<sup>12</sup> are marvels of modern economic history. Although relentlessly rigorous in his work, he insisted on the need to reach a synthesis between opposing views or, failing that, to provide a workable alternative. In his *Income Distribution* (North Holland, 1975) he writes:

It would not be difficult, even for this author, to write a convincing critique, and many such reviews will be written. Constructive criticism will be more valuable and must consist of alternatives. (p.150)

Moreover, Tinbergen did not practice economics as "l'art pour l'art." Research, in his opinion, had to be directed at policy and implementation. In the macro-economic arena this would lead to a break with tradition in several ways — both in the way that research was conducted and in the manner in which the results could be used toward the solution of economic problems.

Firstly, the scope of analysis changed. Tinbergen's use of regression analysis enabled the identification of multiple causes of a particular economic phenomenon. It was quite revolutionary when he demonstrated, early in his career, that, for example, production cycles are not just generated within the market of that particular commodity but by the interaction between many different variables in other markets and even in the economy as a whole.

Secondly, time patterns of impacts were shown to range from a short one-week period to several years, particularly in industries with extensive machinery and building investment.

Third, he worked with feedback-loops among his variables: *A* may influence *B* in a certain way, and *B* may have an impact on *A*. Moreover, the time-patterns of these causal relations may differ.

Fourth, he changed the view of governments' place in society and provided a new framework for the formulation of policies in the management of the economy, to be based on a thorough, research-based understanding of the structure within which the

system operates. The traditional practice of economic governance had started with a minimal, narrow set of essential government functions; these functions would be "costed out" and tax rates set to enable these tasks to be carried out. No further "impact analysis" was conducted. Tinbergen, however, using his models, assessed quantitatively the interaction between many macro-economic phenomena, including the expenses and revenues of the government but also employment, national income, inflation, wages, foreign trade etc.<sup>13</sup>

Fifth, and as an extension of the fourth point, Tinbergen proposed that numerical goals be set for various important features of the economy and that the model then be used to derive the necessary levels of those variables that are directly controlled by the government (such as tax rates and parameters, public-sector employment, Central Bank interest rates, etc.). In his most prominent books on this topic<sup>14</sup> he defined the "analytical solution" as the tracing of the economic process following certain government actions, while the "policy solution" answers the question what the authorities ought to do if they want to achieve certain goals.

Sixth, the dimension of the process was enlarged by departing from the simplistic one-to-one approach whereby for any desired level of an economic factor just one measure is taken. In Tinbergen's method, no one "instrument" leads to one single "target"; rather, a group of instruments can be used to achieve desired levels of a group of targets.<sup>15</sup>

Seventh, by varying the values of targets, different sets of necessary instrument values could be derived. Conversely, the process might be from instruments to targets, in the more classical way, but now with the option of having different scenarios of other factors working their way through the model. In the parlance of Dutch economics, the list of options would be known as "het spoorboekje" (train directory).<sup>16</sup>

Eighth, Tinbergen's method could be applied at many different levels and in various domains of economic analysis. As one of his favourite pupils, Jan Pronk,<sup>17</sup> states it:

... the beauty of his analyses and policy models ... lies in the fact that they formed such a coherent, well-balanced and complete

entity, in which everything connects logically: micro, macro, sectoral, regional and global; targets and instruments; process, policy and (socio-economic) order. ... It was always possible to extend the boundaries, for example with education models and regional models, by distinguishing phases and levels of decision procedures.

Notwithstanding his extensive use of the technique he had invented, Tinbergen was fully aware of the fact that economic (or econometric) models can be no more than "stylised reality" and that their resemblance to reality depends not only on the sophistication of the theoretical concepts underlying the model but also on the quality of data used for the estimation of the model's coefficients. While poor data and fuzzy estimates were, in his opinion, better than no data and no estimates (but it must be remembered that he had a great intuitive grasp of magnitudes), he considered the gathering, processing and analysis of reliable information essential components of the scientific process.

#### Tinbergen's research: A few examples

The Great Depression gave rise, in many countries, to investigations into the problem of mass unemployment. The Netherlands played a prime role, led by Tinbergen and a host of clever young researchers — economists and mathematicians alike. Following the publication of the 1935 Labour Plan mentioned earlier, Tinbergen was asked by the Dutch Economics Association to answer the question:

Is a recovery in domestic economic activity in this country possible, whether or not aided by government intervention, even without an improvement in our export position? What can be learned about this problem from the experience of others?

Tinbergen responded with the construction of the world's first economy-wide econometric model; it embodied thirty-one variables, twenty-four equations and data from the period 1923-1933. With this model he traced the possible effects of six different policy cases, ending up with a recommendation to institute a 3-year programme of investment in public infrastructure and a strict price policy.

The reactions were varied.<sup>18</sup> De Wolff (quoted by Knoester and Wellink) would later describe the reception as "a mixture of suspicion and

astonishment". Not surprisingly, the break with the past caused quite a furore — not only because of the methodology used but also for the policy implications. For example, Verrijn Stuart objected to the reversal of causality: does a wage increase cause inflation (the classical view) or do higher prices trigger wage demands (Tinbergen's conclusion)? In fact, during the 1930s Dutch governments had followed a low-wage regime, actually cutting wages across the board in an attempt to stimulate the economy and to dampen inflation. Tinbergen's findings could not support such a policy.

Keynes' reaction was intriguing. Calling Tinbergen's approach "alchemy", he was unimpressed with what he saw as a "quantification of what we already know qualitatively" — unaware of the fact that his own *General Theory of Employment, Interest and Money* (1936) could only become operational by the use of the new, numerical approach to economic policy.

The Dutch model was soon followed, at the request of the League of Nations, by a model of the U.S. economy.<sup>19</sup> During the war a model of the U.K. was constructed, eventually published in 1951. It brought to the fore yet another brilliant Dutch economist, Leen Koyck, whose *Distributed Lags and Investment Analysis* (1954) would become a landmark in econometric literature.<sup>20</sup>

As mentioned earlier, Jan Tinbergen became the first director of the Central Planning Bureau, an institute that would attract worldwide attention for the breadth and depth of its analysis. Despite its name, it did not engage in the actual planning of the economy (such as the French system of indicative planning). By providing analysis of many options of policy, however, it assisted governments of different political compositions with better insights into the feasibility of economic management and growth.<sup>21</sup>

Besides directing research at the CPB, Tinbergen had his own projects (which he pursued after hours and without charge to the Bureau), resulting, among others, in principal lectures to the Dutch Economics Association on "Conditions and measures for replacement of a planned economy with a free economic system" (1947) and "How to restore balance of payments equilibrium" (after the termination of Marshall Aid).

In 1959 followed his contribution on development assistance and policy — an area which had demanded

his attention since he visited India's slums at the beginning of the decade. Indeed, a major portion of Tinbergen's work during the 1950s, '60s and '70s concerned the processes of economic development in the Third World and international economic integration. At the Netherlands School of Economics he established a division of "Balanced International Growth" from which a whole generation of doctorandi and doctores in economic development would graduate.<sup>22</sup> From 1965 to 1972 he served as the first chair of the U.N. Conference for Development Planning.

His work in development and international relations led Tinbergen to the question of the "optimal economic order:" how should a society (local, national, global) be organised so as to maximise the general welfare? As he stated in his Nobel Prize acceptance speech:

The true unknowns of the problem are not so much the quantities of consumption and productive effort to be made and a few more traditional unknowns, but rather the *set of institutions* which taken as a set are able to approach the welfare economic optimum as well as possible.<sup>23</sup>

In this context he foresaw a gradual narrowing of the gap between the economic structures of East and West. Indeed, the economic forms of Soviet perestroika and Western European social democracy are not dissimilar — as predicted by Tinbergen in his "convergence theory."

He repeatedly urged social scientists to engage in objective, productive exchange on the issue of the economic order. As he said in his Nobel lecture:

It is [also our] hope that the interpretation of the socio-economic optimum as a set of institutions may help to get underway a discussion of a more scientific character than was usual so far about the relative merits of various existing socio-economic orders, especially those of Eastern and Western Europe, including such interesting cases as Sweden, Switzerland and Yugoslavia.

It is my hope that ... we may again, as Marx claimed, find scientific arguments in the competition between various systems, but up-to-date scientific arguments rather than obsolete ones.<sup>24</sup>

Unusual for most economists was his inclusion of the distribution of income in the criterion of social optimality.<sup>25</sup> During the 1970s Tinbergen would return to his ideas of some twenty years earlier<sup>26</sup> to analyse the present state of income inequality and assess its necessity for proper economic performance. Using fairly standard economic concepts such as demand and supply, production functions and utility curves, he derived optimal income distributions: they would provide the highest level of society's well-being ("social welfare") while taking into account the economic structure (the constraints of the production system and its inputs). The results are not encouraging for those who believe that their high income is justified: Given present levels of production and education, the top earners should get at most 3.5 times as much as those at the bottom. Without barriers within the labour market (i.e., if all workers were placed in jobs commensurate with their training) that ratio could go down to 3.1. Removing all barriers to education would enable the ratio to fall to 1.3. That is what would occur in a society where no privilege is considered natural, where all are allowed to contribute according to their ability, and where social and cultural prejudices have been removed.

As Jan Pen<sup>27</sup> points out in his in-memoriam article<sup>28</sup> this relative equalisation was actually effected between 1950 and 1980. It greatly saddened Tinbergen that the Dutch Left denounced him for pointing that out.<sup>29</sup>

During the last decade of his busy life, following extensive work and several publications with the Club of Rome, Tinbergen devoted much of his time and effort to the analysis of international relations. With Dietrich Fisher of Pace University he wrote *Warfare and Welfare — Integrating Security Policy into Socio-Economic Policy* (Wheatsheaf & St. Martin's, 1987) in which they derive the optimum structure and management of world society and policies to achieve that optimum.<sup>30</sup>

In *World Security and Equity* (Edward Elgar, 1990) the same theme (of balancing the "needs" of military and civilian expenditures) is addressed, but now incorporating the necessity of development in the Third World. The view is still not promising. To reverse the divergence of the last two decades, the norm for development assistance adopted in 1970 should have been 2.3% of GNP and not 0.7%. If we want to double the ratio of the average incomes in the Third World to that of the First World in 30 years, a net transfer of 2.0% of GNP will be required. At the

present pace of 0.35% it will take, under the most advantageous conditions, over nine centuries for complete equality to be reached.<sup>31</sup>

And for Jan Tinbergen, life-long democratic socialist, there was no good reason why such equality should not be our goal.

### The person Jan Tinbergen

Allow me to reflect briefly on Jan Tinbergen the human being — the man in whose intellectual shadow I was privileged to dwell, who taught me so much of what I know today, and whose friendship was generous and sincere.<sup>32</sup>

Jan Tinbergen was humble in his personal and his scholarly life. His quest for equality made him the most open-minded person I have ever met. As a teacher he had the uncanny gift of turning less-than-brilliant statements and questions into fruitful points of debate. He never put a person down. He lived up to his own contention that, when opinions differ, we should seek compromise or demonstrate the viability of an alternative. During personal encounters he held no monologues but spoke in short sentences, hardly ever longer than a minute at a time, waiting for his visitors to continue with their arguments.

He was forgiving of those who had not reached his level of tolerance. Of the rather unpleasant attacks by Keynes he once remarked that it was a privilege to discuss his work with him. He would not appropriate ideas but gave credit where due (and possibly sometimes even when not due).

With his beloved Tine (who passed away in 1991) he lived a simple life: no drinking, no smoking, no meat, no car. He was once found inside a conference hall while the organising committee was frantically searching for him at the front (car) entrance: the guest of honour had parked his bicycle at the side door instead. He preferably travelled by public transit.<sup>33</sup> In The Hague he knew most tram personnel by name and he once received the honour of being allowed to conduct a streetcar himself. The Tinbergen residence was a simple duplex, with furniture that must have been bought half a century ago. The only sign in the living room of its remarkable master was a beautiful bust — a replica of the bust made upon his being awarded the Nobel Prize in 1969, donated by the sculptor.

Jan Tinbergen worked hard, getting up at 6:30 (Sundays at 7:30!) and labouring until the early hours of the evening. His work was plentiful, his material wants limited. Once he was almost rejected for a development assignment because his bid was too low. To the agency concerned it came as a surprise that Jan Tinbergen did not wish any compensation for himself — just out-of-pocket expenses.

Despite his heavy workload he was always willing to help the activists outside the academy, whether in the Labour Party,<sup>34</sup> the Socialist Youth movement, Politeia (the national left student organisation) — or, on a much larger scale, such organisations as the World Federalists on whose board he served for so many years. For loafers he had little time; he demanded from us that we carry on with our work. When one of my radical friends asked him what he should do, study or be an activist. Tinbergen immediately replied: "Finish your study, for it is educated people whom we need." But he did not shy away from activism, speaking out against injustices. Few will forget how — at age 85 — he addressed a mass demonstration against the Dutch government's plan to cut development assistance. A few years earlier he was one of the main organisers of ECAAR (Economists Against the Arms Race) and, shortly before his death, he became a co-founder of Child Right Worldwide, a movement against child labour.

Needless to say, Jan Tinbergen's support for my work was kind and generous. I would never leave his house without getting some reading material or some references for research. He showed a keen interest in my academic and organisational work, whether my university teaching, the Labour Studies Programme at the University of Manitoba, or my work with the Society for Socialist Studies (the Canadian association of Progressive scholars).

Jan Tinbergen passed quietly away on 9 June 1994, having written what would become his last page the night before. I cannot think of a greater person in whose footsteps I should try to follow.

### NOTES

<sup>1</sup> Economics and Labour Studies, University College, University of Manitoba, Winnipeg, R3T 2M8. Internet vorst2@ccm.umanitoba.ca.

I am very grateful to my good friend and colleague Dr. Jacob Kol, editor of Jan Tinbergen's oeuvre, for providing much time and clarity during my visit to the Erasmus University in the summer of 1994, shortly after Tinbergen's death. Dr. Albert Jolink, Tinbergen's official biographer, was kind enough to send me a preliminary and yet to be completed bibliography. Dr. Kol and Prof. Jan Berkouwer (Hogeschool Holland, co-author with Tinbergen of his last book, *The Future of Socialism*, published in 1994 in both Dutch and English) provided much appreciated comments on the draft paper. The usual disclaimer for their responsibility applies.

<sup>2</sup> Quoted in J. Kol and P. de Wolff, "Tinbergen's Work: Change and Continuity", *De Economist*, 1993, 141:1, pp. 1-28. Reprinted in A. Knoester and A.H.E.M. Wellink (eds., 1993), *Tinbergen Lectures on Economic Policy* (North-Holland Elsevier), pp. 27-54.

<sup>3</sup> Sociaal-Democratische Arbeiderspartij (S.D.A.P., Social-Democratic Workers' Party) -- after WWII reborn, through a merger with some smaller parties, as Partij van de Arbeid (P.v.d.A., Labour Party).

<sup>4</sup> This society — since 1987 called the Koninklijke Vereniging voor de Staathuishoudkunde (Royal Economics Association) — is the oldest such organisation in the world. By comparison, sister organisations in Germany, the United States and Great Britain did not see the light until 1872, 1885 and 1890, respectively. The official organ of the KVS, *De Economist*, was founded in 1852 and is the oldest such journal in existence; it publishes quarterly, alternating between Dutch and English. For more information on the KVS, see "Tinbergen and the Royal Netherlands Economic Association" by A. Knoester & A.H.E.M. Wellink in their *Tinbergen Lectures on Economic Policy*, pp. 9-26.

<sup>5</sup> The KVS holds a major congress once a year, during which several prominent economists present their "pre-adviezen," major research reports on a topic selected some months earlier. This tradition dates back to 1892.

<sup>6</sup> *Het plan van de arbeid* (Arbeiderspers, 1935), a joint product of the S.D.A.P. and the socialist trade union congress (Nederlands Verbond van Vakverenigingen).

<sup>7</sup> Tinbergen reminisced about the Plan in his contribution to *Wetenschappelijk socialisme: over de 'plannen' van SDAP en PvdA* (Scientific socialism: on the 'plans' of the SDAP and the PvdA) published in cooperation with the Wiardi Beckman Stichting, the scientific bureau of the PvdA, by Bert Bakker, Amsterdam, 1982. This small volume reviews the history of the principal documents of the Dutch labour movement. For a popular history of "the Plan", see *Het moet, het kan! Op voor het Plan* by John Jansen van Galen, Jan Nekkers, Dick Pels and Jan Pronk (Bert Bakker & Wiardi Beckman Stichting, 1985).

An earlier survey of Dutch debates on economic planning and policy was published as a theme-issue of *Socialisme en Democratie* (Socialism and Democracy), the scientific journal of the P.v.d.A., in January 1961 (18:1). Tinbergen's contribution was (typically) devoted to the topic "from national to international planning."

<sup>8</sup> "Tinbergen's Work: Change and Continuity".

<sup>9</sup> Tinbergen spoke originally of a "mathematical machine".

<sup>10</sup> Traditionally, four types of equations are distinguished: behavioural (such as a consumption function, linking consumer expenditures to income), technical (for example a production function, showing how a combination of labour and other resources can generate output), institutional (e.g., tax rates), and definitional (e.g., profit equals revenue minus cost). Only the first two types of relations need formal estimation and testing of coefficients.

<sup>11</sup> He wrote one of the earlier textbooks of econometrics: *Econometrie. Werkwijzen en resultaten van econometrisch onderzoek* (Econometrics. Methods and results of econometric research). Gorinchem: Noordduyn & Zoonen, 1941. In the fifties it was translated into English, German, French and Danish. Despite its technical nature and appearance, it concentrates on economics, explaining how statistical methods may be used to clarify the workings of economic phenomena.

<sup>12</sup> For example *De les van dertig jaar* (The Lesson of Thirty Years; Elsevier, 1944) and *Lessons from the Past* (Elsevier, 1963).

<sup>13</sup> In simple terms this means solving an algebraic equation system.

<sup>14</sup> *On the Theory of Economic Policy* (North Holland, 1952) and *Economic Policy, Principles and Design* (North Holland, 1956).

<sup>15</sup> Tinbergen attributed this method to another Dutch economist, Tjalling Koopmans, who would make his career with the Cowles Commission for Research in Economics (Colorado Springs and later Chicago) and the foundation of the same name (at Yale), and was rewarded with a Nobel Prize a few years after Tinbergen.

<sup>16</sup> Although recognising that economic policy should attempt to reach some optimum, Tinbergen worked with fixed values, thus implicitly fixing the nation's level of welfare. Hans Theil, who would come to Rotterdam from Amsterdam and set up one of the world's most respected centres of quantitative economic research at the Netherlands School of Economics (the Econometric Institute), extended Tinbergen's work to include a maximisation of a social preference function subject to the macro-economic model's equations; see his *Optimal Decision Rules for Government and Industry* (North Holland, 1964). His earlier *Economic Forecasts and Policy* (North Holland, 1958, 1961) is dedicated to "J. Tinbergen, forecaster and policy-maker", and also honours Tinbergen by naming a behavioural function a "Tinbergen surface". Besides his significant contributions in the field of econometric methodology and empirical investigations, Theil's approach to the teaching of the statistical methods of econometrics has become standard in the profession, although his own *Principles of Econometrics* did not appear until 1971 (Wiley).

<sup>17</sup> Currently Dutch Minister of Development Affairs. The following is taken from his unpublished lecture "Tinbergen en de internationale inkomensverdeling" (Tinbergen and international income distribution) at a meeting of the KVS, Erasmus University, 17 June 1993. I thank Mr. Pronk for having made this text available; the translation is mine.

<sup>18</sup> See Knoester and Wellink, "Tinbergen and the Royal Netherlands Economic Association", pp. 15-19.

<sup>19</sup> *Statistical Testing of Business Cycles Theories*, Vol. I: *A method and its application to investment activity*.

Vol. II: *Business cycles in the United States of America, 1919-1932*. Also published in French. Geneva, 1939.

Some of the debate on the 1936 model and subsequent research took place in *The Economic Journal* during the years 1939 and 1940. It was, of course, cut short by WWII. Word has it that some correspondence with Keynes was found at Tinbergen's residence following his death; I have been unable to have this rumour confirmed.

Keynes had two principal objections to Tinbergen's work: (i) he posited the impossibility of ever constructing an exhaustive list of explanatory variables for any one dependent variable, and (ii) he raised the theoretical-statistical problem of using some variables both as dependent and as independent factors in one and the same model estimation process. The former would give rise to the so-called specification-bias analysis and the latter to Koopman's research into the effects of the simultaneous equation bias of stochastic regressors - see, for example, his edited volume *Statistical Inference in Dynamic Economic Models*, Cowles Commission for Research in Economics, Monograph No. 10 (Wiley, 1950).

<sup>20</sup> Koyck's promising career was cut off by his sudden death in 1963.

<sup>21</sup> See *Scope and Methods of the Central Planning Bureau* (CPB, 1956) and *25 jaar Central Planbureau* (Staatsuitgeverij, 1970) for some background information on the history and workings of this agency. A useful book is James Albert's *Economic Policy and Planning in the Netherlands, 1950-1965* (Yale University Press, 1969), which also discusses the CPB's econometric models and the quality of the forecasts made therewith.

<sup>22</sup> One of these is Jan Pronk, referred to above, and one of Tinbergen's favourite "biggen" (as the staff members of B.I.G. were sometimes called in a Dutch word play, "big" meaning "piglet" or, in student circles, "young pupil"). Pronk's ideas may be found in his recent collection of essays *De Kritische grens — beschouwingen over tweespalt en orde* (The critical boundary — reflections on division and order, Prometheus, 1994).

<sup>23</sup> Emphasis in the version reprinted in *The American Economic Review*, 71:8 (December 1981).

<sup>24</sup> Loc. cit. He placed a clear priority on this research, finishing his lecture as follows: "This more fundamental research in economics deserves relatively more attention and resources than the more superficial versions of economic research directed at forecasting or analysing very short-term fluctuation in market prices, on which quite some money is being spent today."

<sup>25</sup> Entirely strange this is not; during the first few post-war decades, a more equal income distribution was one of the five goals of Dutch economic policy, the others being full employment, low inflation, a favourable balance of trade, and moderate economic growth.

<sup>26</sup> See, for example, *Redelijke Inkomensverdeling* (Reasonable Income Distribution; Gulden Pers, 1953).

<sup>27</sup> Co-author with Tinbergen of *Naar een rechtvaardiger inkomensverdeling* (Toward A More Justifiable Income Distribution; Elsevier, 1977).

<sup>28</sup> "Een grandioze visie op de inkomensverdeling" (A Grandiose Vision of Income Distribution; *Economisch-Statistische Berichten*, 79:3968, 29 June 1994, pp. 612-14.

<sup>29</sup> Pen also mentioned that Tinbergen's income distribution work is based on a positional-exchange idea originally posed by his mentor Paul Ehrenfest, alluded to earlier in my paper.

<sup>30</sup> They dedicated this book to Olof Palme, the late Swedish prime-minister (slain on 28 February 1986), "who with sympathy and commitment gave so much of his talent, knowledge and energy for a better world."

<sup>31</sup> He was very concerned about the distribution of increased well-being *within* Third-World countries, which tends to generate income inequalities similar to those in the First World. For greedy politicians and other functionaries he had neither time nor patience - something that did not endear him to some.

<sup>32</sup> Tinbergen was a very private person, hardly ever talking about himself. Besides some of my personal reminiscences, I present here some tidbits culled from various memorial articles in the Dutch press and elsewhere.

<sup>33</sup> He was a pioneer in the analysis of passenger rail markets. In "De vraag naar personenvervoer per spoor" (Demand for passenger rail transport; *De Nederlandsche Conjunctuur*, May 1939, pp. 79-89) he used regression analysis to detect the most significant determinant of the demand for passenger rail transport. It turned out to be the development of the national wage bill. The ticket prices were shown to be of lesser importance.

<sup>34</sup> Tinbergen was not interested in holding public office but did serve the labour movement in many advisory and editorial capacities. He was a member of the editorial board of *De Socialistische Gids* (The Socialist Guide), the pre-war scientific journal of the S.D.A.P., and of the management board of the research bureaus of the S.D.A.P. and the P.v.d.A. (the latter agency being called the Wiardi Beckman Stichting, for the young socialist leader who, like so many of his people, was murdered by the Nazis).