This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: The Measurement of Durable Goods Prices

Volume Author/Editor: Robert J. Gordon

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-30455-8

Volume URL: http://www.nber.org/books/gord90-1

Conference Date: n/a

Publication Date: January 1990

Chapter Title: Front matter to "The Measurement of Durable Goods Prices"

Chapter Author: Robert J. Gordon

Chapter URL: http://www.nber.org/chapters/c8307

Chapter pages in book: (p. -19 - -4)

## The Measurement of **Durable Goods Prices**

## Robert J. Gordon



**National** Bureau of **Economic** Research



## The Measurement of Durable Goods Prices



A National Bureau of Economic Research Monograph

# The Measurement of Durable Goods Prices

Robert J. Gordon



ROBERT J. GORDON is the Stanley G. Harris Professor in the Social Sciences at Northwestern University.

The University of Chicago Press, Chicago 60637
The University of Chicago Press, Ltd., London
© 1990 by the University of Chicago
All rights reserved. Published 1990
Printed in the United States of America
99 98 97 96 95 94 93 92 91 90 5 4 3 2 1

#### Library of Congress Cataloging-in-Publication Data

Gordon, Robert J. (Robert James), 1940-

The measurement of durable goods prices/Robert J. Gordon.

p. cm.—(A National Bureau of Economic Research monograph) Includes bibliographical references.

ISBN 0-226-30455-8 (alk. paper)

1. Price indexes. 2. Prices. I. Title. II. Series.

HB231.G57 1990

338.5'28-dc20

89-29895

CIP

 The paper used in this publication meets the minimum requirements of the American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48−1984.

#### National Bureau of Economic Research

#### **Officers**

Richard N. Rosett, chairman George T. Conklin, Jr., vice-chairman Martin Feldstein, president and chief executive officer Geoffrey Carliner, executive director Charles A. Walworth, treasurer Sam Parker, director of finance and administration

#### Directors at Large

John H. Biggs Andrew Brimmer Carl F. Christ George T. Conklin, Jr. Kathleen B. Cooper Jean A. Crockett George C. Eads Morton Ehrlich Martin Feldstein George Hatsopoulos Franklin A. Lindsay Paul W. McCracken Leo Melamed Geoffrey H. Moore

Michael H. Moskow

James J. O'Leary

Robert T. Parry
Peter G. Peterson
Robert V. Roosa
Richard N. Rosett
Bert Seidman
Eli Shapiro
Harold Shapiro
Donald S. Wasserman

#### **Directors by University Appointment**

Charles H. Berry, Princeton
Bill Brainard, Yale
James Duesenberry, Harvard
Ann F. Friedlaender, Massachusetts Institute
of Technology
Jonathan Hughes, Northwestern
Saul Hymans, Michigan
Marjorie McElroy, Duke

James L. Pierce, California, Berkeley Andrew Postlewaite, Pennsylvania Nathan Rosenberg, Stanford James Simler, Minnesota William S. Vickrey, Columbia Burton A. Weisbrod, Wisconsin Arnold Zellner, Chicago

#### Directors by Appointment of Other Organizations

Richard Easterlin, Economic History
Association

Bruce Gardner, American Agricultural
Economics Association

Robert S. Hamada, American Finance
Association

Robert C. Holland, Committee for Economic
Development

David Kendrick, American Economic
Association

Eric Kruger, The Conference Board

Ben Laden, National Association of Business
Economists

Rudolph A. Oswald, American Federation of Labor and Congress of Industrial Organizations

Douglas D. Purvis, Canadian Economics
Association

Dudley Wallace, American Statistical Association

Charles A. Walworth, American Institute of Certified Public Accountants

#### **Directors Emeriti**

Moses Abramovitz Emilio G. Collado Solomon Fabricant Frank W. Fetter Thomas D. Flynn Gottfried Haberler

George B. Roberts Willard L. Thorp

#### Relation of the Directors to the Work and Publications of the National Bureau of Economic Research

- 1. The object of the National Bureau of Economic Research is to ascertain and to present to the public important economic facts and their interpretation in a scientific and impartial manner. The Board of Directors is charged with the responsibility of ensuring that the work of the National Bureau is carried on in strict conformity with this object.
- 2. The President of the National Bureau shall submit to the Board of Directors, or to its Executive Committee, for their formal adoption all specific proposals for research to be instituted.
- 3. No research report shall be published by the National Bureau until the President has sent each member of the Board a notice that a manuscript is recommended for publication and that in the President's opinion it is suitable for publication in accordance with the principles of the National Bureau. Such notification will include an abstract or summary of the manuscript's content and a response form for use by those Directors who desire a copy of the manuscript for review. Each manuscript shall contain a summary drawing attention to the nature and treatment of the problem studied, the character of the data and their utilization in the report, and the main conclusions reached.
- 4. For each manuscript so submitted, a special committee of the Directors (including Directors Emeriti) shall be appointed by majority agreement of the President and Vice Presidents (or by the Executive Committee in case of inability to decide on the part of the President and Vice Presidents), consisting of three Directors selected as nearly as may be one from each general division of the Board. The names of the special manuscript committee shall be stated to each Director when notice of the proposed publication is submitted to him. It shall be the duty of each member of the special manuscript committee to read the manuscript. If each member of the manuscript committee signifies his approval within thirty days of the transmittal of the manuscript, the report may be published. If at the end of that period any member of the Board, requesting approval or disapproval, the President shall then notify each member of the Board, requesting approval or disapproval of publication, and thirty days additional shall be granted for this purpose. The manuscript shall then not be published unless at least a majority of the entire Board who shall have voted on the proposal within the time fixed for the receipt of votes shall have approved.
- 5. No manuscript may be published, though approved by each member of the special manuscript committee, until forty-five days have elapsed from the transmittal of the report in manuscript form. The interval is allowed for the receipt of any memorandum of dissent or reservation, together with a brief statement of his reasons, that any member may wish to express; and such memorandum of dissent or reservation shall be published with the manuscript if he so desires. Publication does not, however, imply that each member of the Board has read the manuscript, or that either members of the Board in general or the special committee have passed on its validity in every detail.
- 6. Publications of the National Bureau issued for informational purposes concerning the work of the Bureau and its staff, or issued to inform the public of activities of Bureau staff, and volumes issued as a result of various conferences involving the National Bureau shall contain a specific disclaimer noting that such publication has not passed through the normal review procedures required in this resolution. The Executive Committee of the Board is charged with review of all such publications from time to time to ensure that they do not take on the character of formal research reports of the National Bureau, requiring formal Board approval.
- 7. Unless otherwise determined by the Board or exempted by the terms of paragraph 6, a copy of this resolution shall be printed in each National Bureau publication.

To my parents, Robert Aaron Gordon (1908–78) and Margaret S. Gordon



### Contents

Pref	ace	xv
I. Introduction a	ND METHODOLOGY	
1. Intr	oduction and Summary of Findings	3
1.1	Introduction: Purpose of the Project and	
	Statement of Main Result 3	
1.2	The Importance of Accurate Price	
	Measures 8	
1.3	The Scope of This Study 14	
1.4	Summary of the Results 17	
1.5	What Is Wrong with the PPI? 27	
1.6	Qualifications to the Findings 32	
2. Con	ceptual Issues in the Measurement of	
	e and Quality Changes	40
	Introduction 40	
2.2	The Input Price Index 43	
	Measuring the Input Price Index When	
	Quality Change Is Nonproportional 45	
2.4	The Output Price Index 47	
2.5	The Equivalence of Input and Output Price	
	Indexes 52	
2.6	Comparison with Previous Approaches to	
	the Quality Adjustment Issue 53	
2.7	A Model Incorporating Operating Costs 60	
2.8	Adapting the Input Price Index to	
	Incorporate Nonproportional Changes in	
	Not Revenue 62	

2.9 2.10 2.11 2.12	Implementation of Operating Cost Adjustments 66 Used Asset Prices and the Accuracy of Quality Adjustments 71 Interpretation of the Proposed Conceptual Framework 73 Summary and Conclusion 77	
3 The M	Methodology of Quality Adjustment	79
	Introduction 79	,,
	Official Price Indexes: Coverage and Procedures 80	
3.3	Methodology of Quality Adjustment in the BLS Indexes 84	
3.4	The Hedonic Regression Technique: Basic Features 89	
3.5	The Hedonic Regression Technique: Pitfalls 92	
3.6	Relative Advantages of the Hedonic and Conventional Methods 99	
3.7	Implementation of Quality Adjustments for Changes in Operating Efficiency 101	
3.8	Comparison of "Closely Similar"  Models 105	
3.9	Summary and Conclusion 106	
II. Studies of Indiv	idual Products	
4. Comr	nercial Aircraft	111
4.1	Introduction 111	
4.2	Postwar Performance of the Airline Industry 113	
4.3	Index of Sale Prices of Identical Models 115	
4.4	Price Changes and Quality Improvements for Particular Models 124	
4.5	Quality Adjustments Based on Net Revenue Data 129	
4.6	Used Aircraft Prices and Pairwise Model Quality Comparisons 143	
4.7	Price Indexes Adjusted for Changes in Operating Efficiency 148	
4.8	Conclusion 152	

5.	Elec	tric Utility Generating Equipment	157
	5.1	Introduction 157	
	5.2	The Technology of Electricity	
		Generation 158	
	5.3	Postwar Performance of the Electric Utility	
		Industry 161	
	5.4	Characteristics of the Sample of Generating	
		Plants 164	
	5.5	Hedonic Price Regressions for Equipment	
		Cost 168	
	5.6	Price Indexes Implied by Hedonic	
		Regression Equations 174	
	5.7	Adjusting for Changes in Operating	
	<b>5</b> 0	Cost 177	
	5.8	The Impact of Environmental	
	<i>5</i> 0	Legislation 183	
	5.9	Conclusions and Topics for Further	
		Research 185	
6.		nputer Processors and Peripherals	188
	6. l	Introduction 188	
	6.2	1	
		Industry 191	
	6.3	Implementation of the Hedonic Regression	
		Methodology 193	
	6.4	The Data 196	
	6.5	Regression Results 202	
	6.6	The New Processor Price Index and Its	
		Interpretation 212	
	6.7	Peripherals and Weighting Issues 224	
	6.8	Price Indexes for Personal Computers: A	
	<i>(</i> 0	Pilot Study 236	
	6.9	Conclusion 237	
7.	Elec	ctrical Appliances	241
	7.1		
	7.2	The Postwar Development of the Appliance	
		Industry 243	
	7.3	Data Sources: The Sears Catalog and	
		CR 245	
	7.4	Common Features of the Hedonic	
		Regression Equations 247	
	7.5	Household Refrigerators and	
		Refrigerator-Freezers 249	

7.7 7.8 7.9 7.10	Room Air Conditioners 270 Washing Machines 282 Clothes Dryers 294 TV Sets 300 Other Products 309 Overall Price Indexes and Conclusion 315	
8. New :	and Used Automobiles	321
8.1	Introduction 321	
8.2	Issues That Arise in Estimating Hedonic	
	Regressions for Automobiles 323	
8.3	Data Used in the Hedonic Regression Study 332	
8.4	Regression Estimates for New Cars 335	
8.5	Hedonic Regression Estimates for Used Cars 346	
8.6	Changes in Quality Mandated by Safety and Environmental Regulations 350	
8.7	Fuel Economy 353	
8.8	Discounting, Premia, and the "Transaction Price Proxy" 355	
8.9	The "Final Alternative" Index 362	
8.10	Comparisons of "Closely Similar"	
	Models 365	
8.11	Conclusion 366	
9. Other	Products	383
9.1	Introduction 383	
9.2	Tractors 383	
9.3	Telephone Transmission and Switching Apparatus 395	
9.4	Other Types of Communication Equipment 404	
9.5	Railroad Equipment 408	
9.6	Conclusion 412	
III. Sources for the	Pricing of Numerous Products	
Data	fication Price Indexes from Sears Catalog	417
10.1	Introduction 417	
10.2	The Colorful History of the Sears Catalog 419	
10.3	Catalog Price Indexes: Advantages and Disadvantages 424	

10	0.4 Catalog Price Index Methodology 433	
10	0.5 Office, Computing, and Accounting	
	Machinery 439	
10	0.6 Communication Equipment 448	
10	0.7 Fabricated Metal Products 449	
10	0.8 Engines and Turbines 452	
10	0.9 Metalworking Machinery 457	
	10 General Industrial Equipment 463	
	11 Electrical Transmission, Distribution,	
	and Industrial Equipment 465	
10.	.12 Furniture and Fixtures 467	
	13 Agricultural Machinery (Including	
	Garden Tractors and Excluding Farm	
	Tractors) 468	
10.	14 Construction Machinery (Except	
	Tractors) 469	
10.	•	
	Electrical Equipment, n.e.c. 470	
10.	16 Behavior of the Average Sears/PPI	
	Ratio 471	
10.		
44 77		
	ing Unit Value Indexes to Measure	400
	ansaction Prices and Quality Change	490
	1.1 Introduction 490	
11	1.2 Background of the Transaction Price	
	Issue 491	
11	1.3 Conceptual Problems in the Use of	
	Census Unit Values 493	
11	1.4 Characteristics of the Data and	
	Calculation of Indexes 496	
	1.5 Tests of Cyclical Behavior 500	
	1.6 Secular Drift in the Unit Value Ratios 504	
11	1.7 Concluding Evaluation of Unit Value	
	Indexes 514	
W Waxayaya Isa	ues and Final Results	
IV. WEIGHTING ISS	UES AND FINAL RESULTS	
	eighting the Alternative Data Sources into	
	w Price and Output Measures for Producer	
	d Consumer Durable Equipment	519
	2.1 Introduction 519	
	2.2 Coverage of the Study 520	
12	2.3 The Overall Drift of the	
	Alternative/Official Price Ratios 526	

12.4	Time Series for the New PDE Deflator	
	and Associated Real PDE	
	Investment 540	
12.5	Investment/GNP and Capital Stock/GNP	
	Ratios 545	
12.6	Alternative Deflators for Expenditures on	
	Consumer Durable Goods 549	
12.7	Implications for Shares of GNP and	
	Sources of Growth 554	
12.8	Conclusion 557	
the NIPA	ing Producers' Durable Equipment in , 1967 and Earlier Years	561
Product-h	B (Tables B.1-B.17). Detailed by-Product Annual Listing of Alternative ial Price Indexes (1972 = 1.00)	570
Categorie	C (Tables C.1–C.6). "Secondary" PDE s, Annual Listing of Alternative and rice Indexes (1972 = 1.00)	696
Reference	s	705
Index		715