



FOUR ESSAYS ON TRADE, PAYMENTS
AND IMPERFECT COMPETITION

BY

JAN INGVALD HAALAND

Center for Applied Research
Norwegian School of Economics
and Business Administration
Bergen 1984

CONTENTS

Introductory notes	i
Noen aktuelle teorier for valutakurs- og betalingsbalanseutvikling	1
A two-period model of temporary equili- brium with monopolistic competition	35
Stationary equilibrium in a small, open economy with monopolistic competition	79
Growth and the terms of trade with monopolistic competition	134

FOUR ESSAYS ON TRADE, PAYMENTS
AND IMPERFECT COMPETITION

INTRODUCTORY NOTES

The four essays in this volume constitute my doctoral dissertation at the Norwegian School of Economics and Business Administration. Each essay is a separate entity. The essays are, however, thematically interrelated. The best way of looking at the relationship between the papers is probably as serial dependence rather than as an overall interdependence. While it may be difficult to see the direct connection between, say, the first and the last essay, it should be no problem to see that the second paper is related to the questions posed in the first; that the third work is an extension (from a short-run to a long-run perspective) of the second paper, and finally that the fourth essay takes up some special features from the long-run model analysed in the preceding paper.

Essay no. 1, 'Noen aktuelle teorier for valutakurs- og betalingsbalanseutvikling', is, basically, a survey of some of the recent literature on balance of payments theory. The Monetary Approach to the balance of payments is discussed, and some of the criticism against both the theoretical and the empirical parts of the approach is also presented. Then I focus on balance of payments results in models of temporary equilibrium in open economies. In such models, often called fixed-price models, it seems as if the results may be very sensitive to the basic assumptions made w.r.t. number and types of markets, etc., and the essay tries to sort out similarities and differences in balance of payments effects in such models. The paper ends with a brief discussion of flexible exchange rates in the various models.

In Essay no. 2, 'A two-period model of temporary equilibrium with monopolistic competition', I analyse short-term (dis)equilibrium situations for a small, open economy trading

in a world in which there is imperfect competition in the commodity markets. Domestically, the nominal wage rate is rigid, and both full employment and unemployment situations are studied. The structure of the model is similar to that of simple fixed-price models, but the assumption of imperfect (monopolistic) competition makes the analysis more complicated and the results less clear-cut than in such models.

In the third essay, 'Stationary equilibrium in a small, open economy with monopolistic competition', the basic market structure is the same as in the preceding paper, but here the perspective is on long-run stationary equilibrium. Unlike in the short-run model, it is now required that expectations are rational, and there is balanced trade, full employment and endogenous determination of the number of active firms (a zero profit condition) in equilibrium. A substantial part of the paper spells out the micro-economic foundation for such an economy, in a simple overlapping generation framework.

Essay no. 4, 'Growth and the terms of trade with monopolistic competition', treats the question of how terms of trade are determined for an economy like the one described above, i.e. an economy trading in a world where intra-industry trade has a dominating position. In the literature on trade in similar, differentiated products one has traditionally assumed so much symmetry both between commodities and countries, that in equilibrium prices have always been identical; hence the terms of trade have never been an interesting issue in these models. If, however, one introduces some kind of asymmetry in such a model, the terms of trade need no longer be identically equal to unity, and it becomes interesting to study the effects on relative prices of shifts in domestic or international conditions. In this essay, the basic asymmetry between the small country and the rest of the world is that whereas all commodities from the small country are traded internationally, not all of the varieties produced in the rest of the world are exported to our small country. Hence, it is an assumption of relative openness, and it says that the small country is the more open one of the two countries in the model.

Essay no. 1 is reprinted from Statsøkonomisk Tidsskrift, no. 2, 1982. The second essay has been issued as Discussion Paper no. 06/82 at the Norwegian School of Economics and Business Administration. An earlier version of Essay no. 3 exists as Working Paper MU 05 (1984) from Center for Applied Research. Finally, the last essay has been issued as Discussion Paper no. 07/84 at the Norwegian School of Economics and Business Administration.

As a help (or rather a warning) to the reader it should be mentioned that there are substantial differences in notation between the papers. Especially when it comes to a comparison between the last two papers this may cause some confusion, as a number of the symbols used in both papers have different meanings in the papers. The reason for this inconsistency is that whereas the number of variables to keep track of is very great in Essay no. 3, the same is not true in the fourth one, and when writing the latter I chose clearness and simplicity, rather than consistency with the preceding essay.

During the work on these essays I have benefited from discussions with colleagues and friends at the Norwegian School of Economics and Business Administration and at the Center for Applied Research. Agnar Sandmo gave detailed comments on the first essay. I have had a very useful and clarifying discussion with Avinash Dixit on the topics of the third and fourth essay. And, in particular, I would like to thank my supervisor, Victor D. Norman, for inspiring discussions and very constructive criticism during the entire period I have been working on these essays.

I appreciate greatly having been given the opportunity to finish the thesis while working on the project 'World Market Prospects' at the Center for Applied Research.

Særtrykk av Statsøkonomisk Tidsskrift nr. 2, 1982

NOEN AKTUELLE TEORIER FOR VALUTAKURS- OG BETALINGSBALANSEUTVIKLING

AV JAN INGVALD HAALAND*

1. *Innledning*

Jeg skal i denne artikkelen se på noen aktuelle tilnærminger til betalingsbalanse- og valutakursproblematikk. Betalingsbalanse og valutakurs er i prinsippet to sider av samme sak, og hvilken av disse størrelsene man fokuserer på i teorien, avhenger av hvilke forutsetninger man går ut fra med hensyn til det rådende valutasystem. Med faste valutakurser (institusjonelt bestemt) vil naturlig nok ikke en analyse av valutakursutvikling ha noen særlig mening. I en slik situasjon vil derimot betalingsbalansen bli en sentral størrelse for de fleste land, og teoretiske såvel som empiriske analyser av utviklingen i betalingsbalansen vil kunne gi viktige bidrag til forståelsen av hvordan økonomien fungerer. Hvis på den annen side valutakursen tillates å fluktuere fritt, vil betalingsstrømmene til og fra utlandet tendere til å være i balanse. Da vil det være utviklingen i valutakursen som er av primær interesse.

Fra den annen verdenskrig til 1971 var de fleste lands valutaer knyttet sammen i et system med faste kurser. Kursene var fastlagt gjennom den såkalte Bretton Woods-avtalen, og kursendringer (devaluering og revaluering) var bare tillatt når land hadde alvorlige og vedvarende problemer på grunn av reell ulikevekt. I 1971 brøt dette systemet sammen, og siden den tid har det ikke vært noen ensartet valutapolitikk internasjonalt. Noen land har knyttet sine valutaer sammen i valutablokker med tilnærmet faste kurser innbyrdes, men med fleksibilitet i kursene overfor land utenfor blokken. Andre land har valgt å stabilisere sin valuta i forhold til en kurv av utenlandske valutaer, f.eks. veiet etter handelssamkvemmet med andre land. Atter andre lar sine valutaer flyte relativt fritt.

Den lange perioden under Bretton Woods systemet førte til at det meste av forskning og modellbygging på området har tatt utgangspunkt i et regime med faste valutakurser. Mange ulike teorier for

* Jeg takker Victor D. Norman og Agnar Sandmo for gode råd og vink.

betalingsbalanseutvikling har vært framsatt og testet, og man har blant annet viet en god del oppmerksomhet til spørsmålet om hvordan diskrete skift i kursnivået vil virke inn på økonomien. På 70-tallet har det også kommet fram en del litteratur som tar utgangspunkt i en situasjon med flytende valutakurser, men fremdeles er fastkurssystemer det som er best analysert såvel teoretisk som empirisk. Vi kommer i denne artikkelen derfor til å se mest på modeller som forutsetter faste valutakurser. Men som allerede nevnt, er der ingen prinsipielle forskjeller i modelloppbyggingen i de ulike systemer. Ulikhetene kommer inn i bildet når vi skal bestemme hva som er endogene og hva som er eksogene variabler. Videre vil selvsagt valutasystemet ha betydning for hvilke økonomisk-politiske virkemidler som er tilgjengelige, og ikke minst for effektiviteten av disse. Når det gjelder selve oppbyggingen av modeller vil imidlertid det primære være å komme fram til hvilke forhold i økonomien det er som påvirker transaksjonene til og fra utlandet, og disse forklaringsvariablene bør være de samme enten det er valutakursen eller betalingsbalansen vi retter oppmerksomheten mot.

Hva kan så årsakene være til at et lands betalingsstrømmer til og fra utlandet ikke er i balanse? Grunnene kan være så mange, og problemstillingen har vært angrepet på diverse ulike måter i litteraturen. Tilnæringsmåten avhenger av tidsperspektivet, av hvilke forutsetninger man tar med hensyn til fleksibilitet i prisene, av om man antar full sysselsetting, etc. Med helt fleksible priser og full sysselsetting vil ubalanse i betalingsstrømmene kunne framkomme som et likevektsfenomen. Med prisrigiditet og arbeidsledighet vil vi på den annen side typisk ha en reell ulikevekt.

I en likevektskontekst kan betalingsubalanse framkomme ved at forskjellige land har ulik konsumprofil over tid. Underskudd på betalingsbalansen i dag kan «kjøpes» mot planlagt overskudd i framtiden. Dixit og Norman (1980) har lagt stor vekt på dette poenget, og de utleder sin versjon av monetær betalingsbalanseteori ved å ta utgangspunkt i maksimering av intertemporale nyttefunksjoner. Vi skal komme tilbake til dette senere.

Når det gjelder ulikevektstilnæringer, så er analysemulighetene svært store. Avhengig av hvor mange forskjellige markeder man har med, og av hvilke priser som er rigide, vil kompleksiteten i modellen kunne varieres mye.

Med dette har jeg antydnet de tilnærminger til betalingsbalanseproblematikken som vil bli behandlet i denne artikkelen. Jeg vil først se på en likevektstilnærming representert ved monetær betalingsbalanseteori. Etter så å ha gått gjennom en del av den kritikken som har framkommet mot monetær betalingsbalanseteori, vil jeg vise hvordan problemstillingen kan angripes i moderne fastprismodeller. Litteraturen er foreløpig ikke særlig omfattende på dette området, men en del er skrevet, og vi skal se på noen av de viktigste bidragene.

2. Monetær betalingsbalanseteori

Transaksjoner til og fra utlandet vil alltid bestå av to deler: en strøm av varer og tjenester, og en motsvarende strøm av betalingsmidler. Uttrykt i en felles enhet, f.eks. innenlandske penger, må disse strømmene være like store, og summert over alle transaksjoner i en periode får vi to ekvivalente uttrykk for landets betalingsbalanse. Med to likeverdige uttrykk for betalingsbalanse, kan vi spørre hvilket det er mest hensiktsmessig å ta utgangspunkt i når vi skal studere betalingsbalansen nærmere. Tradisjonelle tilnærminger til problemstillingen (elastisitets- og absorpsjonstilnærmingen) anså vare- og tjenestestrømmene som det primære, og dannet teorier ut fra etterspørsels- og tilbudsforhold i disse markedene.

Monetær betalingsbalanseteori tar utgangspunkt i pengesiden av transaksjonene. De enkleste versjonene av monetær betalingsbalanseteori kan gi inntrykk av at det bare er pengemarkedet som betyr noe, og at tilpasningen i andre markeder på en måte kommer i annen rekke. I den grad der er generell likevekt er det imidlertid ikke snakk om første og annen rekke, men derimot om simultan, optimal tilpasning i alle markeder. Under slike forhold vil resultatet av analysen bli det samme enten vi ser på pengemarkedet eller vare- og tjenestemarkedene, og tilhengerne av monetær betalingsbalanseteori mener da at en fokusering på pengemarkedet gir det beste bildet av den økonomiske tilpasningen som ligger bak likevekten.

Det finnes etter hvert mye litteratur om monetær betalingsbalanseteori. En del av de første og viktigste bidragene er samlet i Frenkel og Johnson (1976). De fleste bidragsyterne bygger sine modeller over samme lest, og Kreinin og Officer (1978) gir en fin oversikt over lik-

heter og ulikheter i såvel teoretiske som empiriske bidrag til denne tilnæringsretningen. Vi skal her kort se på hovedtrekkene i de enkleste versjonene av monetær betalingsteori, og framstillingen bygger stort sett på Kreinin og Officer (1978).

Det forutsettes at penger er det eneste finansielle aktivum som kan handles internasjonalt, og et lands betalingsbalanse framkommer som netto strøm av penger fra utlandet i perioden. Dette må igjen være lik forskjellen mellom etterspørsel og tilbud av penger innenlands. Modellene tar som utgangspunkt at der er stabile langsiktige pengeetter-spørselsfunksjoner i makro, slik at publikums etterspørsel etter realpengemengde kan skrives som en stabil funksjon av relativt få variabler. I det enkleste tilfellet vil vi ha

$$(1) \quad M^d/P = L(y, i)$$

hvor M^d er nominell pengeetterspørsel, P er prisnivå, i er rentesats, og y er realinntekt. Det er flere viktige momenter å legge merke til her. For det første det at det dreier seg om etterspørsel etter realpenger som en beholdning. Akkurat dette at det er beholdningen av penger (stock) og ikke pengestrømmen (flow) som inngår i publikums tilpasningsvilkår, blir av flere regnet som denne teoriretningens viktigste bidrag (se f.eks. Hahn (1977)). Pengestrømmer vil i dette bildet framkomme som justeringer for å nå et optimum. Men det betyr at pengestrømmene ikke vil vedvare periode etter periode. Slike strømmer vil bare være et middel til å nå optimal tilpasning, og så snart optimal pengebeholdning er oppnådd, vil grunnlaget for pengestrømmen falle bort.

Et annet poeng er at man studerer tilpasningen på lang sikt. Hva som skjer på kort sikt, vies ikke noen særlig oppmerksomhet i monetær betalingsbalanseteori. Hva menes så med lang sikt? Det er det ikke så lett å finne svaret på. Krenin og Officer antyder at det må være et sted mellom ett og ti år, men noen nærmere presisering av tidsperspektivet har de ikke kunnet finne holdepunkt for i litteraturen.

For det tredje bør vi merke oss at det er realpengemengde (real balance) som etterspørres. Det må innebære at publikum har klare prisforventninger, ettersom det er framtidens priser som betyr noe her. Hensikten med å holde penger må jo være at det gir muligheter til å kjøpe varer og tjenester i senere perioder, og da kan ikke dagens

priser være spesielt interessante. Dette punktet er ikke diskutert noe videre i litteraturen, men Dixit og Norman (1980, kap. 7) har vist at det kreves ganske sterke forutsetninger for å kunne dekomponere ønsket framtidig kjøpekraft i en realpengeetterspørsel og et uttrykk for forventet prisnivå. Jeg skal ikke gå nærmere inn på dette her; det bør bare være nevnt at det å studere etterspørsel etter realpengemengde ikke nødvendigvis er helt uproblematisk.

Tilbudet av penger er i de enkleste modellene produktet av en konstant multiplikator, m , og den monetære base, B , dvs. $M^s = m \cdot B$. B består av en innenlandsk komponent, D , og en internasjonal komponent, R . D er den kreditt som skapes innenlands, og de monetære myndigheter antas å ha kontroll over denne størrelsen. R er verdien, målt i innenlandske penger, av de internasjonale reservene myndighetene og sentralbanken sitter med. I et regime med faste valutakurser vil som regel myndighetene ha forpliktet seg til å veksle inn så mye utenlandsk valuta som ønsket til en gitt valutakurs, og slik innveksling vil da slå ut som en endring i R . Nå er det i tillegg vanlig å anta at innbyggerne i landet ikke kan sitte med beholdninger av utenlandsk valuta; slik valuta må straks veksles om til innenlandske penger. Da vil nettoresultatet av all handel i utenlandsk valuta i en periode være lik endringen i R i perioden; dvs. endringen i R blir lik over- eller underskuddet på betalingsbalansen i perioden.

Likevekt i pengemarkedet (som beholdning) vil her være gitt ved

$$M^d = m \cdot R + m \cdot D .$$

Monetær betalingsbalanseteori postulerer at der vil være en tendens i retning av en slik likevekt i pengemarkedet. Full likevekt i pengemarkedet betyr at alle beholdninger er i ønsket størrelse. Da vil også betalingsstrømmene til og fra utlandet være i balanse.

Betalingsubalanse kan oppstå ved skift i pengeetterspørsel eller i innenlandsk pengetilbud. Vi har

$$m\Delta R = \Delta M^d - m\Delta D .$$

En økning i etterspørselen etter penger, som ikke møtes av et tilsvarende skift i innenlandsk tilbud, vil altså medføre en endring i beholdningen av utenlandsk valuta. Dette vil manifestere seg som et overskudd på betalingsbalansen. Men her er det viktig å merke seg at det

dreier seg om et engangs-skift i M^d , og ikke om vedvarende endringer. Det betyr at overskuddet på betalingsbalansen heller ikke vil vare ved; det vil bare eksistere så lenge pengeetterspørselen er større enn det totale pengetilbudet. På denne måten vil vi, ifølge monetær betalingsbalanseteori, ha en selvjusterende prosess. Betalingsubalanse oppstår som følge av at pengetilbudet ikke er lik den ønskete pengebeholdning. Men nettopp denne ubalansen i betalingsstrømmene overfor utlandet virker inn på det innenlandske pengetilbudet, slik at dette endres i retning av ønsket beholdning.

Pengetilbudet vil altså ikke være eksogent gitt i denne modellen. Myndighetene vil kunne styre den innenlandske del av tilbudet, men ikke totaltilbudet. Vi kunne da tenke oss at myndighetene ville prøve å hindre at betalingsubalanse får slå ut i pengetilbudet, ved å foreta motsvarende endringer i D , dvs. drive fullstendig steriliseringspolitikk. Monetaristene forutsetter som regel at slik sterilisering ikke finner sted, og da vil, som vi har sett, over- og underskudd på betalingsbalansen korrigere seg selv på lang sikt. Men denne justeringen til nye likevektsnivåer kan ta tid, og teorien sier sjelden noe hverken om hvor lang tid det tar, eller om den dynamiske prosessen som finner sted før ny langsiktig likevekt er oppnådd.

En vanlig forutsetning i monetær betalingsbalanseteori er at pengeetterspørselen ikke påvirkes av tilbudet, og at multiplikatoren er upåvirket av forhold i pengemarkedet. Under slike forutsetninger vil innenlandsk pengepolitikk, representert ved endring i D , ikke ha noen langsiktig virkning. En økning i D vil føre til en like stor reduksjon i R , så lenge pengeetterspørselen er uendret. Det betyr at en ekspansiv pengepolitikk vil gi underskudd på betalingsbalansen på kort sikt, men på lengre sikt vil økonomien bevege seg tilbake til likevekten.

En devaluering vil heve prisene innenlands. Da vil realpengemengden bli mindre, mens folks etterspørsel etter realpenger vil være uendret i denne modellen. Publikum vil da søke å gjenopprette beholdningslikevekt i penger ved å kjøpe mindre varer og tjenester ut av en gitt inntekt. Vi får et temporært overskudd på betalingsbalansen, men dette vil bare vedvare inntil beholdningslikevekt igjen er opprettet i pengemarkedet. En devaluering virker altså via en realbalanse-effekt i denne modellen; relative priser, eller tilbuds- og etterspørsels-elasiteter spiller ingen rolle, ifølge monetaristene.

Dette gir grunntrekkene i monetær betalingsbalanseteori. Litteraturen omfatter mange anvendelser og alternative framstillinger av denne teorien, men de hovedtrekkene som er gjengitt her, går igjen i de fleste versjoner. Teorien har også dannet grunnlaget for en rekke empiriske undersøkelser. Vi skal kort komme tilbake til disse siden; først skal vi imidlertid se litt på noe av den kritikken som er framkommet mot selve grunntrekkene i teorien.

Kritikk mot monetær betalingsbalanseteori

Slik teorien er framstilt her, virker den enkel og tilforlatelig. Man starter ut fra en del eksplisitte forutsetninger, og kan ved hjelp av enkel analyse trekke forholdsvis kraftige konklusjoner. De fleste vil kanskje stille spørsmålstegn ved noen av de forutsetningene som tas, og det med rette. Der er imidlertid en del problemer selv om man godtar disse forutsetningene. Hahn (1977) gir en kritisk framstilling av de teoretiske artiklene som finnes i Frenkel og Johnson (1976). Han kommer med kritikk som dels retter seg mot enkeltartikler, og dels mot teoriretningen generelt. Et av Hahns viktigste ankepunkter retter seg mot selve utgangspunktet for monetær betalingsbalanseteori, nemlig det at overskudd på betalingsbalansen identifiseres med overskuddsetterspørsel etter penger. Dette vil bare være korrekt så lenge det ikke er ulikevekt i andre markeder i økonomien. I de enkleste modellene innebærer det at vi må kreve likevekt i vare- og arbeidsmarkedet. Med over- eller underskuddsetterspørsel etter varer eller arbeid, vil ikke denne viktige identiteten holde, og man kan ikke lenger bare se på pengemarkedet når betalingsbalansen skal studeres. Dette betyr at de fleste bidragene til monetær betalingsbalanseteori mer eller mindre eksplisitt forutsetter full fleksibilitet i priser og lønninger. Vi må ha full sysselsetting, og ingen rasjonering hverken av varer eller arbeidskraft. Hahn hevder at dette er så sterke forutsetninger at de i det minste burde vært gjenstand for nøyere granskning, i stedet for bare implisitt å bli antatt. Jeg skriver her «de fleste bidrag», fordi der finnes unntak. Rodrigez (1976) f.eks. tar utgangspunkt i en keynesiansk situasjon i en økonomi med faste priser.

Hahn kritiserer også selve den økonomiske analysen. Han hevder at bidragsyterne i Frenkel og Johnson (1976) ikke i tilstrekkelig grad,

og ofte ikke i det hele tatt, undersøker entydighets- og stabilitetsegenskaper ved likevektsløsningene. Det er, ifølge Hahn, ingen grunn til at det kun skal være ett likevektspunkt i den type modell vi har gjennomgått. Men med flere likevektsløsninger kan pengepolitikk få realøkonomisk betydning. Vi så jo nemlig at pengepolitiske inngrep kunne bringe økonomien bort fra likevekt på kort sikt, men at det så på lengre sikt ville foregå en automatisk justering tilbake til et likevektspunkt. Hvis det eksisterer flere likevektsløsninger, trenger man da ikke å komme tilbake til den opprinnelige posisjonen etter et slikt pengepolitisk inngrep. Således kan myndighetene ved hjelp av pengepolitikk eller f.eks. devaluering, bringe økonomien fra én likevekt til en annen, og en slik politikk vil opplagt kunne ha realøkonomisk betydning også på lang sikt. Denne type problemer er ikke diskutert i det hele tatt i monetær betalingsbalanseteori.

Hahn savner også en diskusjon om hvorvidt de likevektsløsninger som framkommer, er stabile. De fleste bidrag innen monetær betalingsbalanseteori synes å forutsette at likevektene er stabile, og det undersøkes ikke nærmere hva som må til for å sikre slik stabilitet. Dixit og Norman (1980) ofrer stabilitetsspørsmålet stor oppmerksomhet, og deres analyse viser at Hahns bekymring for stabilitetsegenskapene ikke var uberettiget. Det vises for det første at det er en nær sammenheng mellom de kvalitative virkningene på betalingsbalansen av en devaluering, av kontraktiv pengepolitikk hjemme, og av ekspansiv pengepolitikk i utlandet, og at disse virkningene igjen er knyttet til spørsmålet om den langsiktige likevektens stabilitet. Videre påpekes det at det i en generell modell er vanskelig å finne økonomisk tolkbare stabilitetsbetingelser som både er nødvendige og tilstrekkelige. Brutto-substitusjon mellom alle varer (og også penger) er en tilstrekkelig, men ikke nødvendig, betingelse for stabilitet. Men bruttosubstitusjon er en svært sterk antakelse, som sjelden vil være oppfylt, og det som er vist, er da bare at eventuell ustabilitet må komme av komplementariteter.

I en mer restriktiv modell viser Dixit og Norman en interessant sammenheng mellom monetær betalingsbalanseteori og den neoklassiske elastisitetstilnærmelsen. Elastisitetstilnærmelsen forutsetter implisitt at det kan separeres mellom realbeslutninger og finansielle beslutninger. Dixit og Norman legger inn denne forutsetningen i sin mone-

tære modell, og videre begrenser de analysen til tilfellet med 2 varer (Dixit og Norman har, i motsetning til den enkle modellen gjengitt over, også med varemarkeder i sin modell). Da viser det seg faktisk at Marshall-Lerner betingelsen for at en devaluering skal bedre handelsbalansen, også vil være en nødvendig og tilstrekkelig betingelse for at den langsiktige likevekten skal være stabil. Det er altså en kvalitativ sammenheng mellom monetær betalingsbalanseteori og elastisitetstilnærmelsen, og dette er en sammenheng som ikke kommer fram i vanlige framstillinger av den monetære teorien. Der blir nemlig stabilitet implisitt eller eksplisitt forutsatt, uten at vilkårene for en stabil løsning tas opp til diskusjon i det hele tatt. Nå er forutsetningene for elastisitetstilnærmelsen så restriktive at denne siste modellen ikke er særlig relevant i praksis. Men det at det her framkommer en relasjon mellom monetær teori og neoklassisk elastisitetsteori, tyder på at det vil være en sammenheng også i mer generelle modeller.

Som vi ser, bekrefter Dixit og Normans analyse at Hahns bekymring for stabilitetsegenskapene er på sin plass. Det viktigste i Hahns kritikk mot monetær betalingsbalanseteori er nok allikevel det at man forutsetter seg bort fra alle andre alternativer enn dem man ønsker å studere. Man forutsetter likevekt i varemarkedene, full sysselsetting, ingen usikkerhet, kun ett finansielt aktivum, etc., og da er det ikke så rart at man til slutt kan vise at realbalanseeffekten er det viktigste. Spesielt påpeker Hahn det beklagelige ved at det kun sees på situasjoner med Walras-likevekt. Hahn hevder at verdensøkonomien i 1970-årene ikke akkurat bar preg av å være i Walras-likevekt, og dette burde kanskje ha virket inn på modellbyggingen. Nettopp modeller som tar for seg ikke-walraske situasjoner er tema for siste del av denne artikkelen, idet vi der skal se på betalingsbalansespørsmål i moderne fastprismodeller. Men før vi går over til disse modellene, skal vi se på noen av de empiriske undersøkelsene som er gjort på grunnlag av monetær betalingsbalanseteori, og jeg skal også nevne noen utvidelser av teorien utover rammen av den enkle modellen som er skissert.

E m p i r i

Med faste valutakurser er et lands reserver en følge av tilbud og etterspørsel etter penger. Vi har tidligere sett at likevekt i pengemarkedet kan skrives som

$$(2) \quad L(P, y, i) = m \cdot (D + R)$$

Mange empiriske studier av betalingsbalansen tar utgangspunkt i denne likningen, og finner herfra et uttrykk for endring i reservene som funksjon av endringer i de andre variablene. Vi kan f.eks. differensiere (2) logaritmisk, og komme fram til følgende uttrykk¹

$$(3) \quad \frac{R}{R + D} \cdot \Delta \ln R = a_1 \cdot \Delta \ln P + a_2 \cdot \Delta \ln y + a_3 \cdot \Delta \ln i + a_4 \cdot \Delta \ln m + a_5 \cdot \frac{D}{R + D} \cdot \Delta \ln D$$

Monetær betalingsbalanseteori søkes ofte verifisert ved å kjøre enkle regresjoner på likning (3), eller på tilsvarende uttrykk. Man antar at variablene på høyresiden er gitt eksogent, og kan da ut fra teorien si noe om forventet størrelse på koeffisientene. Som regel forutsettes det at pengemultiplikatoren, m , er konstant, slik at leddet $a_4 \cdot \Delta \ln m$ faller bort. Monetær betalingsbalanseteori tilsier da at koeffisientene a_1 og a_2 skal være positive, mens a_3 og a_5 forventes å være negative. Dette skyldes at høyere prisnivå eller realinntekt øker etterspørselen etter penger, hvilket medfører en innstrømming av valuta. Høyere rentenivå gir større alternativkostnad ved pengehold og reduserer således etterspørselen, og til slutt ser vi at D og R inngår identisk i (2), slik at endret D bør medføre like stor motsatt endring i R . Det betyr at koeffisienten foran D ikke bare bør forventes å være negativ; den bør være lik -1 . Videre bør vi finne $a_1 = 1$, idet vi tidligere har sett at det er etterspørselen etter *real*penger som er det primære.

Jeg skal ikke i detalj gjengi noen av de empiriske undersøkelsene som har vært foretatt, men jeg kan nevne noen få. Genberg (1976) har testet en relasjon tilsvarende (3) for Sverige for årene 1950 til 1968. Han har justert for eventuell steriliseringspolitikk ved å bruke to-trinns minste kvadraters metode, med $D/(R + D) \cdot \Delta \ln D$ som instrumentvariabel. Genberg mener selv at hans resultater gir god grunn til å akseptere monetær betalingsbalanseteori.

Zecher (1976) har testet en relasjon svarende til (3) med vanlig minste kvadraters metode på data for Australia, mens Bean (1976) har gjort det samme for Japan. Begge rapporterer om tilfredsstillende

¹ Differensiering gir selvsagt $a_4 = a_5 = -1$. Når dette ikke er skrevet direkte inn i (3), kommer det av at de fleste undersøkelser tester størrelsene på disse koeffisientene empirisk, i stedet for å legge inn apriori restriksjoner.

resultater, og hevder at deres undersøkelser bekrefter monetær betalingsbalanseteori.

Kreinin og Officer (1978) gir en summarisk oversikt over en rekke empiriske studier som tar utgangspunkt i likning (3), og de gir også sin egen vurdering av resultatene. De tre studiene som er nevnt her (Genberg, Zecher, og Bean) blir av Kreinin og Officer vurdert til å gi blandete resultater, dvs. at de ikke i ett og alt bekrefter den monetære betalingsbalanseteorien. Dette synes forøvrig å være et fellestrekk ved mange av de undersøkelsene Kreinin og Officer har tatt for seg; forfatterne selv karakteriserer sine resultater som meget tilfredsstillende, mens utenforstående observatører stiller seg mer tvilende til om resultatene faktisk inneholder så mye som det forfatterne hevder.

Andre har stilt seg enda mer skeptisk enn Kreinin og Officer til empiriske undersøkelser av den typen vi hittil har sett på. Magee (1976) kritiserer ganske kraftig studier som går ut på å bruke minste kvadraters metode på relasjoner som likning (3). Utgangspunktet må, ifølge Magee, være at vi har et simultansystem med penge-, kapital- og varemarked. Likning (3) må da oppfattes som en redusert form i et slikt system, og for å kunne estimere denne direkte med minste kvadraters metode, er forutsetningen om eksogenitet i høyresidevariablene viktig. At disse variablene kan regnes som eksogent gitt, begrunnes som regel av monetaristene med at analysen er langsiktig, og at vi ser på et lite land. y er gitt på grunn av full sysselsetting på lang sikt, mens P og i på lang sikt er gitt lik tilsvarende nivåer i resten av verden, idet vårt lille land ikke kan påvirke disse verdensmarkedsnivåene. Videre er forutsetningen om at det ikke drives steriliseringspolitikk viktig for å kunne anvende vanlig minste kvadraters metode på (3).

Magee spør seg så hvilke virkninger det kan ha på estimeringsresultatene, når man tester en slik langsiktig teori på data med forholdsvis korte perioder. Mange empiriske undersøkelser gir relativt gode resultater på måneds- og kvartalsdata, og dette kan i første omgang virke overraskende. Men Magee hevder at de gode resultatene kan komme nettopp av at man har benyttet kortsiktige data. Hvis eksogenitetsforutsetningene ikke holder på kort sikt, vil det oppstå simultanitetsproblemer i estimeringen, og spørsmålet er hvordan dette kan virke inn på resultatene. En eksogen økning i reservene, R , vil kunne øke

realinntekten, gi stigning i prisnivået, og reduksjon i rentenivået. Dersom ikke y , P og i er eksogent gitt på kort sikt, vet vi altså ikke i hvilken retning årsaksvirkningene går, men vi ser at koeffisientene som framkommer, vil være de samme uansett, slik at vi har en kraftig favorisering av monetær betalingsbalanseteori når resultatene skal tolkes. Videre påviser Magee at ulike spesifiseringsfeil kan påvirke koeffisientene foran D i forskjellige retninger. Når de fleste studier finner en koeffisient foran D som ikke er signifikant forskjellig fra -1 , trenger det derfor ikke nødvendigvis bety at den modellen man startet ut fra, er korrekt. Modellen kan f.eks. inneholde flere spesifikasjonsfeil som opphever hverandre.

Johannes (1981) går videre på denne kritikken. Han hevder at forutsetningen om eksogenitet er en hypotese med testbare implikasjoner. Han viser til en metode for slik testing (Geweke (1978)), og anvender denne for å undersøke om forklaringsvariablene i (3) faktisk er eksogent gitt. Johannes tar for seg data for 5 land (Australia, Frankrike, Tyskland, Norge og Sverige), og konkluderer med at forutsetningen om eksogent gitte høyresidevariabler i (3) ikke er korrekt for noen av landene, i hvertfall ikke på kort eller mellomlang sikt. Den mest forsiktige slutning som må trekkes på grunnlag av dette, er, ifølge Johannes, at empiriske tester av monetær betalingsbalanseteori er utsatt for alvorlige simultanitetsproblemer. En mye mer radikal konklusjon vil være at selve den teoretiske spesifiseringen av teorien er feil. Johannes innrømmer at hans materiale kanskje ikke er stort nok til å gi grunnlag for en så sterk slutning, men resultatene gir i alle fall klare indikasjoner på at eksogenitet ikke bare kan forutsettes uten videre.

Til sammen gir Magee og Johannes sterke argumenter for at vi bør være skeptiske til estimeringsresultater som tilsynelatende bekrefter monetær betalingsbalanseteori ved hjelp av enkle regresjoner på kort-siktige data.

E n u t v i d e l s e a v t e o r i e n

En forutsetning som mange har hatt vanskelig for å akseptere, i monetær betalingsbalanseteori, er at penger er det eneste finansielle aktivum som handles internasjonalt. Kouri og Porter (1974) har utviklet en modell hvor det finnes innenlandske og utenlandske verdi-

papirer i tillegg til penger. Publikum har da valget mellom å holde penger eller å ha beholdninger av ulike verdipapirer, og resultatet av et slikt valg blir typisk at man ønsker å ha en portefølje av forskjellige aktiva. Modellen forklarer internasjonale kapitalbevegelser ved at publikum i ulike land tilpasser seg til endrete beholdningslikevekter i forskjellige aktiva. Likevektsporteføljene kan bli endret som følge f.eks. av endret realinntekt, endrete avkastningsrater på forskjellige aktiva, usikkerhetsfaktorer, etc., og tilpasningen til ny likevekt kan medføre kapitalstrømmer mellom land.

Sammenliknet med den monetære betalingsbalanseteorien vi har gjennomgått tidligere, kan vi si at Kouri og Porter splitter opp reserveendringen, ΔR , i en handelsbalanse (current account) og en kapitalstrøm. De hevder så at strømmen av varer og tjenester er eksogent gitt, mens kapitalstrømmen er det elementet som sørger for at økonomien beveger seg mot likevekt i pengemarkedet. Kouri og Porter kommer fram til en relasjon hvor kapitalbevegelse er avhengig variabel, og de tester denne på data fra 4 land (Tyskland, Australia, Italia og Nederland). De finner at en hovedårsak til kapitalstrømmer er endringer i tilbud og etterspørsel etter penger, og videre at pengeetterspørselen ofte endres som følge av fluktuasjoner i realinntekten. Kapitalbevegelser mellom land vil således kunne reflektere ulike vekstrater i landene. Et annet viktig resultat er at endringer i handelsbalansen (current account balance) for en stor grad vil medføre motsvarende endringer i kapitalstrømmene (offsetting capital flows), slik at betalingsbalansen blir stabilisert.

Ut fra dette konkluderer Kouri og Porter med at den totale betalingsbalansen vil bli dominert av faktorer som påvirker kapitalstrømmene, og da spesielt av endring i realinntekt, endring i verdens rentenivå, endring i valutakursforventninger, og endringer i pengepolitiske instrumenter. Aktiv pengepolitikk vil i denne modellen slå ut i endrete kapitalbevegelser overfor utlandet, og de empiriske resultatene viser at i den grad pengepolitikken i det hele tatt har innenlandske virkninger, så kan det bare skje parallelt med store endringer i landets internasjonale reserver. Dette at pengepolitikken fullstendig skal miste sine tilsiktete virkninger på grunn av motsvarende kapitalbevegelser, har blitt kritisert både på teoretisk (Fratanni (1977)) og empirisk (Neumann (1978)) grunnlag, men alle synes i det minste å være enige

om at kapitalbevegelser vil bidra til å svekke virkninger av aktiv pengepolitikk innenlands.

3. Fastprismodeller

En av de viktigste innvendinger mot monetær betalingsbalanseteori er at man bare studerer situasjoner med Walras-likevekt. Dixit og Norman (1980) karakteriserer dette ved å si at monetær betalingsbalanseteori i prinsippet bare er en utvidelse av standard teori for internasjonal handel, idet man i tillegg til handel i goder i dag, tillater handel i fordringer på framtidige goder. Den eneste forskjellen er at disse fordringene kommer i form av finansielle aktiva, heller enn som kontrakter på spesifikke goder i framtiden. Manglende balanse på betalingsstrømmene til og fra utlandet vil i denne kontekst ikke komme som følge av markedssvikt, men snarere være et tegn på at man utnytter gevinstene ved intertemporal handel.

Betalingsbalanseproblemer oppstår imidlertid typisk sammen med andre problemer i økonomien, f.eks. arbeidsledighet, og da vil ikke lenger monetær betalingsbalanseteori være særlig egnet til å analysere situasjonen. Dessuten vil man under slike forhold ofte være mer opptatt av hva som skjer i den nærmeste framtid, enn av hvordan den langsiktige likevektsløsningen vil bli, og da vil heller ikke den monetære betalingsbalanseteori være til noen hjelp. Det vil selvsagt alltid være mulig å konsentrere oppmerksomheten om pengestrømmene når man skal studere betalingsbalansen, men det er ikke sikkert det vil være særlig hensiktsmessig når forutsetningene bak monetær betalingsbalanseteori ikke lenger er oppfylt.

En viktig antakelse i monetær teori er at pengeetterspørselen kan skrives som en stabil funksjon av noen få variabler. Dette vil ikke lenger være tilfelle hvis det er reell ulikevekt i ett eller flere andre markeder. Hvis det f.eks. er arbeidsledighet, vil dette påvirke publikums tilpasning ikke bare i arbeidsmarkedet, men også i vare- og pengemarkedene. Med kvantumsrestriksjoner i ett marked, vil folk måtte rekalkulere sin tilpasning i alle andre markeder, og vi får det som kan kalles betinget etterspørsel og betinget tilbud.¹ Pengeetter-

¹ De engelske betegnelsene er *effective demand* og *effective supply*. Dette har av enkelte blitt oversatt til *effektivt tilbud* og *etterspørsel*, men en slik oversettelse synes ikke å være dekkende for innholdet i begrepene.

spørselen vil ikke kunne skrives som en enkel funksjon av f.eks. prisenivå og inntekt. Sysselsetting, varemangel, kapitalmangel, etc. vil måtte komme inn som argumenter i funksjonen, og da er det ikke lenger så greit å kartlegge virkningene av endringer i variablene.

Problemer av den typen som her er skissert, har i de siste årene blitt forsøkt analysert i det vi med en fellesbetegnelse kan kalle fastpris-modeller, eller kanskje heller modeller for temporær likevekt med rasjonering. Varemangel eller arbeidsledighet må komme av at priser eller lønninger ikke er på sitt likevektsnivå, og det modelleres ofte ved at en eller flere priser holdes helt faste i modellen. Herav følger den første betegnelsen nevnt over, mens den andre betegnelsen henspiller på at løsningene i modellen har et midlertidig, kortsiktig preg, og at en eller annen form for rasjonering er et sentralt trekk. Det er åpenbart urealistisk å operere med eksogent gitte priser. Det vi ønsker å analysere, er en situasjon hvor prisene ikke reagerer fort nok på overskuddstilbud eller overskuddsetterspørsel til at likevekt kan opprettholdes på kort sikt, og bruk av helt faste priser må sees som en analytisk forenkling i forhold til dette. De resultater som oppnås i en slik fastprismodell, vil da forhåpentligvis kunne tas som en indikasjon på hva som kan finnes i mer realistiske modeller. (Se Steigum (1980) for et tilsvarende syn på nytten av å studere fastprismodeller.)

Litteraturen er foreløpig ikke særlig omfattende når det gjelder fastprismodeller for åpne økonomier. Noen viktige bidrag er Dixit (1978), Neary (1980) og Dixit og Norman (1980). Alle disse fokuserer på betalingsbalanse og sysselsetting, og allerede dette lille utvalget viser at analysemulighetene er store og varierte, avhengig av hvor mange ulike markeder som tas med i modellen, og av hvilke priser som holdes faste, og hvilke som tillates å fluktuere. Felles for disse modellene er det at de antar rigide lønninger, hvilket innebærer at arbeidsledighet er en reell mulighet i økonomien. Dixit og Norman (1980) forutsetter at arbeidstilbudet er fast, mens etterspørselen etter arbeidskraft er en funksjon av reallønnen. Dixit (1978) og Neary (1980) lar også arbeidstilbudet være en variabel størrelse, men akkurat denne ulikheten mellom modellene synes ikke å ha noen stor betydning for konklusjonene. Det sentrale er at lønnen kan ligge fast på et nivå som ikke gir likevekt i arbeidsmarkedet.

På varemarkedssiden er det større forskjeller mellom de nevnte

modeller. Dixit opererer med én aggregert vare som landet kan kjøpe og selge så mye det vil av internasjonalt («small country assumption»). Hvis innenlandsk produksjon er forskjellig fra innenlandsk forbruk, vil det slå ut som over- eller underskudd på betalingsbalansen i tilfellet med faste valutakurser, mens vi vil få en kursendring dersom det tillates.

Neary innfører en skjermet sektor i tillegg til et gode som handles fritt. En slik sektor må klareres innenlands, og med prisrigiditet kan kvantumsrasjonering bli et mulig utfall. Da har vi to markeder som muligens må klareres med kvantumsrestriksjoner, nemlig arbeidsmarkedet og den skjermete sektor, og analysearbeidet blir dermed mye mer komplisert.

Dixit og Norman studerer flere ulike situasjoner i varemarkedet. De ser først på et lite land hvor alle varer handles internasjonalt. Modellen minner om Dixits, men i Dixit og Norman er der en vektor av varer som handles, og dermed oppstår muligheten for å drive en selektiv handelspolitikk. Videre ser Dixit og Norman på tilpasningen for store land, dvs. land som er store nok til å påvirke priser på verdensmarkedet. Til slutt analyserer Dixit og Norman noen mulige utfall i situasjoner hvor også varepriser på verdensmarkedet er faste.

E n m o d e l l

Vi skal gå gjennom en enkel fastprismodell her. Modellen er for enkel til å ha noe særlig praktisk relevans; hensikten med den er mer å vise gangen i slikt analysearbeid, og dessuten er det greit å ha noe konkret å knytte den videre diskusjonen til. Den modellen vi skal se på minner om Dixit (1978), men vi skal gjøre ytterligere noen forenklinger. Disse består i at vi skal la arbeidstilbudet være konstant gitt, og at bedriften i vår modell deler ut overskuddet i samme periode som det tjenes opp. Dette poenget med når overskuddet deles ut, viser seg å kunne ha en viss betydning for den kortsiktige tilpasningen, spesielt i modeller som har med en skjermet sektor (se Neary (1980)).

I modellen¹ produseres ett gode i en mengde x , ved hjelp av én innsatsfaktor, nemlig arbeidskraft, l .

$$x = f(l) \quad f' > 0, f'' < 0.$$

¹ En tilsvarende modell er skissert verbalt i Norman og Wergeland (1978).

Bedriften ønsker å maksimere sin profitt

$$\Pi = p \cdot f(l) - w \cdot l$$

Vi ser på et lite land, og bedriften kan således selge så mye den vil til en gitt pris, \bar{P} , på verdensmarkedet. Den innenlandske prisen er gitt ved

$$p = \varepsilon \cdot \bar{P},$$

hvor ε er valutakursen. Med fast kurs vil da prisen være gitt innenlands. Uten noen restriksjoner vil bedriften etterspørre arbeidskraft inntil

$$f'(l) = w/p$$

og vi kan skrive $l = l(w/p)$. Tilbudet av arbeidskraft er, som nevnt, gitt, lik l^* , og full sysselsetting vil være oppnådd når

$$l(w/p) = l^*$$

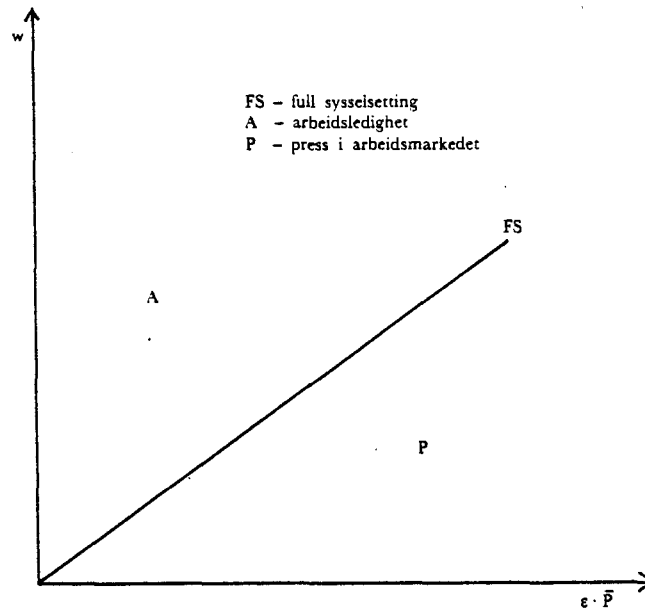
Dermed får vi ett reallønnsnivå, $(w/p)^*$, som gir likevekt i arbeidsmarkedet. Nå er det imidlertid ikke sikkert at dette reallønnsnivået blir realisert. Vi har sett at p er gitt (med fast valutakurs), og hvis vi i tillegg antar lønnsrigiditet, kan godt det realiserede reallønnsnivået, (w/p) , være forskjellig fra $(w/p)^*$. Med $(w/p) > (w/p)^*$ får vi arbeidsledighet, og med $(w/p) < (w/p)^*$ blir det press i arbeidsmarkedet. Dette gir følgende figur som vist på neste side.

Hva så med varemarkedet? I og med at det kan kjøpes og selges fritt internasjonalt, vil det aldri oppstå varemangel eller vareoverskudd i denne økonomien. Derimot vil spørsmålet om overskudd eller underskudd på betalingsbalansen kunne være av interesse, og vi skal prøve å tegne inn en kurve som gir balanse i utenriksøkonomien, i $(w, \varepsilon \bar{P})$ -planet. For å kunne gjøre det, må vi se nærmere på konsumentenes tilpasning. Vi antar at der er én representativ konsument, og at denne har følgende nyttefunksjon

$$u = u(c, M/p)$$

hvor c er konsumert mengde av makrovaren, og M er den pengeomengde som overføres til neste periode. (Vi ser her bort fra problemer

90



Figur 1.

med prisforventninger, idet vi antar at prisene er konstante fra periode til periode.) Nytten maksimeres under budsjettbetingelsen:

$$p \cdot c + M = w \cdot l + \Pi + \bar{M} = p \cdot f(l) + \bar{M}$$

hvor \bar{M} er initial pengemengde. Da får vi følgende etterspørselsfunksjoner

$$c = c(f(l) + \bar{M}/p)$$

$$M = m(f(l) + \bar{M}/p)$$

Betalingsbalansen vil kunne skrives som

$$b = p \cdot x - p \cdot c$$

Vi er interessert i å se hvilke pris- og lønnskombinasjoner som gir $b = 0$. I området med press i arbeidsmarkedet, har vi

$$\begin{aligned}
 b &= p \cdot (x - c) = 0 \\
 P \cdot [f(l^*) - c(f(l^*) + \bar{M}/p)] &= 0 \quad *) \\
 (4) \quad c(f(l^*) + \bar{M}/\varepsilon P) &= f(l^*)
 \end{aligned}$$

Her ser vi lett at vi vil få én valutakurs, $\bar{\varepsilon}$, som gir betalingsbalanse. Lønnsatsen vil ikke spille noen rolle, fordi produksjonsmengden er gitt, og det som ikke betales ut som lønn, vil bli utbetalt som overskudd. Summen av lønn og dividende vil være konstant, og alt deles ut i samme periode. Dixit (1978) lar i sin modell dividenden bli utbetalt én periode etter at overskuddet har oppstått. Da vil opplagt fordelingen mellom lønn og overskudd ha betydning for konsumbeslutningen i inneværende periode. Likeledes vil en modell med flere konsumenter, hvor noen lever av lønnsinntekt og andre av profitt, kunne gi som resultat at fordelingen mellom lønn og overskudd har betydning for betalingsbalansen. I vår modell virker lønnsinntekt og overskudd identisk inn på konsumfunksjonen, og da blir resultatet at valutakursen $\bar{\varepsilon}$ gir balanse i utenriksregnskapet. $\varepsilon < \bar{\varepsilon}$ gir underskudd, mens $\varepsilon > \bar{\varepsilon}$ gir overskudd på betalingsbalansen.

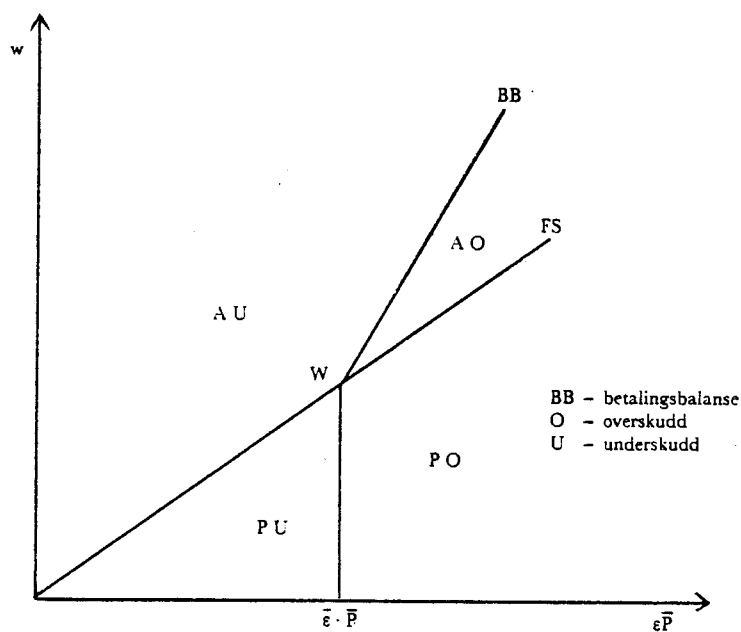
I området med arbeidsledighet må vi også ha konsum lik produksjon for å få balanse i utenriksøkonomien. Men her vil ikke produksjonsmengden være gitt. Vi må ha

$$\begin{aligned}
 x - c &= 0 \\
 (5) \quad f(l(w/\varepsilon P)) - c(f(l(w/\varepsilon P)) + M/\varepsilon P) &= 0
 \end{aligned}$$

Det kan lett vises at dette gir en stigende kurve i $(w, \varepsilon P)$ -planet, og videre ser vi at denne må stige brattere enn linjen for full sysselsetting. (Langs FS-kurven er reallønnen konstant. Da er også produksjonen konstant, og det eneste som skjer i (5), er at vi får en realbalanse-effekt som reduserer konsumet. Det ville gi overskudd på betalingsbalansen, og dermed har vi godtgjort at kurven for $b = 0$ må stige brattere enn FS-kurven.) Vi kan da tegne følgende figur (se neste side)

Vi har delt opp $(w, \varepsilon P)$ -rommet i 4 regimer, alt ettersom det er arbeidsledighet (A) eller press i arbeidsmarkedet (P), og dessuten om der er overskudd (O) eller underskudd (U) på betalingsbalansen. I punktet W vil vi ha full likevekt både i arbeidsmarkedet og i uten-

*) Det skal stå p , ikke P foran hakeparentesen i denne likningen.



Figur 2.

riksøkonomien. Dersom lønningene er rigide, og dessuten valutakursen holdes fast, er der imidlertid ingen spesiell grunn til å forvente at økonomien befinner seg i W. I prinsippet kan en hvilken som helst kombinasjon av w og ε eksistere på kort sikt, og da trenger det ikke å være hverken intern eller ekstern balanse.

Monetær betalingsbalanseteori postulerer at økonomien hele tiden befinner seg på FS-kurven. Likevekt i arbeidsmarkedet opprettholdes ved at lønnsraten fritt kan endres både opp og ned. Ekstern balanse oppnås ved at BB-kurven flytter seg over tid. Vi ser fra (4) at initial pengebeholdning spiller en viktig rolle for plasseringen av BB-kurven. Men inntil likevektsbeholdning er oppnådd, vil initial pengemengde endres fra periode til periode, og derved flyttes BB-kurven. Befinner økonomien seg til venstre for BB, vil underskuddet på betalingsbalansen føre til at pengemengden reduseres. Men dette virker inn på vareetterspørselen i (4), slik at BB-kurven får et skift til venstre. Tilsvarende vil overskudd på betalingsbalansen øke pengemengden, og BB-kurven skifter til høyre. Hvis full sysselsetting sikres gjennom

lønnsfleksibilitet, vil altså økonomien på lang sikt være i likevekt både internt og eksternt.

Men hva skjer hvis lønnsraten er rigid på et så høyt nivå at vi har arbeidsledighet? Den automatiske justeringen av BB-kurven vil fremdeles finne sted, men dette vil ikke kunne føre til full likevekt i alle markeder. Så lenge både w og ε er faste, vil arbeidsledigheten bli opprettholdt i denne modellen, selv om vi på lang sikt kan få ekstern balanse. Det vil være nødvendig med politiske inngrep for å bedre sysselsettingen, og hvis vi er opptatt av situasjonen på kort sikt, kan slike inngrep være nødvendige også for å påvirke den eksterne balansen. Vi skal se litt på effekten av økonomisk-politiske virkemidler. I vår enkle modell er virkningene ganske opplagte, men dette kan fort bli annerledes hvis vi ser på litt mer kompliserte modeller.

En devaluering vil flytte økonomien horisontalt til høyre i figur 2. Devalueringen vil jo bare si at man går fra en fast ε til en annen og høyere. Da ser vi at valutakursendringer kan føre oss i retning av likevekt i arbeidsmarkedet. Med arbeidsledighet kan en devaluering bringe økonomien til FS-kurven, mens et eventuelt press i arbeidsmarkedet kan lettes på ved en revaluering. Kursendringene vil selvsagt også virke inn på betalingsbalansen, men der er ingenting som sikrer at økonomien når fram til likevekt både eksternt og internt samtidig. Fra et punkt i AU-området, kan det f.eks. være at vi må passere kurven for balansert handel før vi når fram til en valutakurs som gir full sysselsetting. Ekstern balanse kan så opprettes f.eks. med aktiv pengepolitikk. Ekspansiv pengepolitikk kan brukes til å eliminere overskudd på betalingsbalansen. Det skjer ved at konsumet øker når pengemengden øker, mens produksjonen forblir konstant i vår modell.

Finanspolitikk

Aktiv finanspolitikk vil ikke ha noen virkning på økonomien innenlands i denne modellen. Offentlig kjøp av varer og tjenester vil bare slå ut som et like stort underskudd på betalingsbalansen. Monetariseringen av de offentlige utgiftene vil bli nøyaktig oppveiet av den virkningen betalingsbalanseunderskuddet har på pengemengden. Da vil hverken konsumentenes eller produsentenes tilpasning bli påvirket, og finanspolitikken vil virke nøyaktig som om det offentlige foretok sine innkjøp direkte i utlandet.

Dixit (1978) kommer også fram til dette resultatet når det gjelder finanspolitikk, og han går litt nærmere inn på hvilke forutsetninger som er essensielle for at et slikt resultat skal gjelde. Det viktigste er at priser og valutakurser er faste, og at alle varer handles internasjonalt. Med en skjermet sektor kan offentlige innkjøp av varer fra denne sektoren ha betydning. Med flytende valutakurs vil økonomien hele tiden være på BB-kurven. Da vil et skift i denne kurven medføre en depresiering av kursen, og vi får samme virkning på sysselsettingen som ved en devaluering. En siste forutsetning som kan ha betydning, er at de offentlige innkjøpene ikke er skattefinansierte, idet skatter ofte vil påvirke priser og lønninger, og derved vil føre til at økonomien beveger seg bort fra den opprinnelige (w, ε) -kombinasjonen. Med disse forutsetningene hevder Dixit at resultatet om at finanspolitikk ikke har noen innenlandsk virkning, er mer robust enn økonomer flest har trodd. Neary (1980) kommer forøvrig fram til de samme resultatene i en modell hvor det også er en skjermet sektor. Offentlig kjøp av varer og tjenester fra den konkurranseutsatte sektor fører bare til en forverring av handelsbalansen, mens innkjøp i skjermet sektor har omtrent samme virkning som en ekspansiv pengepolitikk.

P e n g e p o l i t i k k

Når det gjelder virkningen av aktiv pengepolitikk, ligger vår modell nærmest opp til Dixit og Normans (1980) modell for en liten, åpen økonomi. Med faste valutakurser virker pengepolitikk inn på betalingsbalansen, men den har ingen virkning på arbeidsmarkedet. Med flytende valutakurs vil imidlertid sysselsettingen bli påvirket av pengepolitikk. Da vil jo, som nevnt, økonomien befinne seg på BB-kurven, og med skift i denne får vi også endringer i den faktiske tilpasningen. En pengeekspansjon vil da ha samme kvalitative virkning som en devaluering.

I vår modell har penge- og finanspolitikk omtrent samme virkning i tilfellet med faste valutakurser. Betalingsbalansen påvirkes av aktiv politikk, mens tilpasningen i arbeidsmarkedet forblir uendret. Dixit (1978) får en kvalitativ forskjell mellom virkningen av finans- og pengepolitikk. Dette skyldes at arbeidstilbudet er endogent i hans modell. Pengemengden vil være en av de faktorer som inngår i arbeidstilbudsfunksjonen, og ekspansiv pengepolitikk vil da medføre

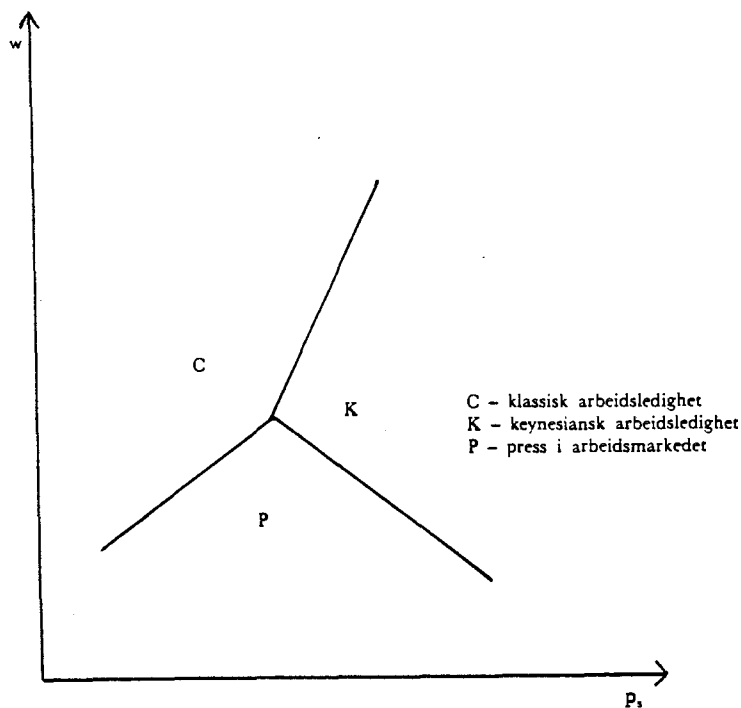
skift oppover i kurven for full sysselsetting. Pengepolitikk vil altså virke både på intern og ekstern balanse i Dixits modell, mens finanspolitikk bare påvirker betalingsbalansen.

Dixit og Norman (1980) ser også på internasjonal likevekt når hjemlandet er stort. Da kan man ikke lenger ta prisene internasjonalt som gitt. I en situasjon med fleksible varepriser, men rigide lønninger, vil det være lønnsatsene hjemme og i utlandet som er avgjørende for forholdene i arbeidsmarkedet. Med lav lønn innenlands og høy lønn i utlandet vil der være press i det hjemlige arbeidsmarked, mens utlandet kan oppleve arbeidsledighet. Tilsvarende kan det oppstå regimer med press både hjemme og ute, eller med arbeidsledighet i alle land. I denne modellen viser Dixit og Norman at ekspansiv pengepolitikk i ett land vil bedre sysselsettingen i alle landene. Men det vil samtidig gi forverret betalingsbalanse for det landet som driver den ekspansive politikken.

Neary (1980) har, som nevnt, med en konkurranseutsatt og en skjermet sektor.¹ Modellen blir da nærmest som en sammensmelting av Dixits modell for en liten, åpen økonomi, og en vanlig fastprismodell for en lukket økonomi (f.eks. Malinvaud (1977)). Neary får, på samme måte som Malinvaud, to ulike former for arbeidsledighet, nemlig det som kalles klassisk og keynesiansk arbeidsledighet. Klassisk arbeidsledighet oppstår ved at reallønnen er så høy at bedriftene ikke ønsker å sysselsette hele arbeidsstokken. Det er med andre ord samme type arbeidsledighet som i vår enkle modell her. Keynesiansk arbeidsledighet oppstår hvis priser og lønninger er slik at der er for lav etterspørsel etter varer fra den skjermete sektor. Hvis p , står for (gitt) pris på skjermet gode, og w står for nominell lønn, kan vi få figur 3 på side 96. Neary får flere varianter av denne figuren, alt ettersom hvilken sektor som får prioritet i arbeidsmarkedet i situasjoner med press, men vi skal holde oss til denne ene. Det er viktig å legge merke til at konsumentene i tillegg til å være rasjonert i arbeidsmarkedet, her også kan oppleve rasjonering i markedet for skjermete varer. Ved klassisk arbeidsledighet f.eks., vil ikke bedriftene produsere den etterspurte mengde av skjermete goder, og markedet må bli klarert ved kvantumsrestriksjoner.

¹ Steigum (1980) studerer også en modell med konkurranseutsatt og skjermet sektor. Han legger imidlertid ikke noe særlig vekt på betalingsbalansespørsmål. Vi skal komme tilbake til Steigums modell avslutningsvis.

96



Figur 3.

Rasjonering i dette markedet virker igjen inn på den betingede etterspørselen etter konkurranseutsatte varer, og derved på betalingsbalansen. Betalingsbalansen kommer ikke fram i figuren, men Neary studerer virkningene på balansen av ulike politiske inngrep, og vi skal se at disse virkningene kan være forskjellige i ulike regimer. Vi ser fremdeles på en liten økonomi, slik at konkurranseutsatte varer kan kjøpes og selges til en gitt pris internasjonalt.

Ekspansiv pengepolitikk vil i denne modellen føre til at området med press i økonomien (P) utvides, mens området med keynesiansk arbeidsledighet blir mindre. Under klassisk arbeidsløshet vil ikke pengepolitikk ha noen virkning på sysselsettingen. Ekspansiv pengepolitikk vil forverre betalingsbalansen i alle regimer, men Neary påpeker at selve den mekanismen som ligger bak forverringen, kan være svært forskjellig fra regime til regime. Med klassisk arbeidsledighet vil en pengeekspansjon føre til større etterspørsel både etter konkur-

ransesatte (K) og skjermete (S) varer, mens produksjonen vil forbli uendret, så lenge prisene er faste. Den økte etterspørselen etter S-varer vil ikke bli møtt, og med bruttosubstitusjon vil derved etterspørselsøkningen etter K-varer bli enda større. Dette fører til større konsum av K-varer uten at produksjonen endres, og vi får underskudd på betalingsbalansen.

Med keynesiansk arbeidsledighet er produksjonen i skjermet sektor begrenset av at folk ikke vil etterspørre nok S-varer. Da vil en pengeekspansjon, med følgende etterspørselsøkning, sette i gang en multiplikatorprosess i den skjermete sektoren, og sysselsettingen bedres. I den konkurranseutsatte sektoren vil fremdeles produksjonen være den samme, så lenge p_K og w er uendret. Konsumet av K-varer vil imidlertid stige både p.g.a. den opprinnelige ekspansjonen, og som følge av at multiplikatorprosessen i den skjermete sektor gir høyere sysselsetting og inntekt. Derved må betalingsbalansen bli forverret. Mens ekspansiv pengepolitikk under klassisk arbeidsledighet fører til at publikum blir enda sterkere rasjonert i markedet for S-varer, vil de altså med keynesiansk ledighet ikke være rasjonert i det hele tatt i varemarkedet. Dette skulle være et godt eksempel på at økonomisk-politiske inngrep kan ha svært forskjellig virkemåte avhengig av hvilken situasjon økonomien er i. Usikkerheten med hensyn til virkningen på betalingsbalansen, blir kanskje enda mer markant når vi ser på en devaluering.

D e v a l u e r i n g

I vår enkle modell var virkningene av en devaluering klare og entydige. Økonomien ville bevege seg til høyre i figur 2, i retning av høyere sysselsetting og bedre betalingsbalanse. Dette resultatet framkommer også i Dixits (1978) modell, og i den enkleste modellen til Dixit og Norman (1980). I modellen til Neary (1980) blir virkningene langt mindre klare. Den skjermete sektor gjør at det kan være vanskelig å si noe sikkert om hvordan en devaluering påvirker betalingsbalansen.

Under klassisk arbeidsledighet vil en devaluering helt sikkert bedre handelsbalansen i Nearys modell. En devaluering er det samme som en prisøkning på konkurranseutsatte produkter. Da øker produksjonen av K-varer, mens etterspørselen etter disse avtar. I den skjermete

sektor vil produksjonen på kort sikt være uendret, idet den er bestemt av w og p_s , og der vil fremdeles være kvantumsrasjonering av S-varer. Denne rasjoneringen vil ha betydning for den betingede etterspørselen etter K-varer, men denne etterspørselen kan allikevel aldri bli større enn den var før devalueringen. Da har vi altså større produksjon og lavere konsum av K-varer, og derved gir devalueringen en bedring i betalingsbalansen.

Med keynesiansk arbeidsledighet vil vi fremdeles få en direkte pris-effekt som trekker i retning av bedret handelsbalanse. Men virkningene i den skjermete sektor blir helt forskjellige. S-varer vil bli relativt billigere etter devalueringen, og det gir økt etterspørsel. Men siden produksjonen er etterspørselsbestemt under keynesiansk arbeidsledighet, vil den økte etterspørselen føre til økt produksjon og sysselsetting. Dermed settes det i gang en multiplikatorprosess i den skjermete sektor, og resultatet blir høyere sysselsetting og inntekt i økonomien. Dette har igjen virkning på etterspørselen etter konkurranseutsatte produkter, og denne inntektsvirkningen kan godt bli større enn den opprinnelige priseffekten. Da kan det tenkes at konsumet av K-varer stiger som følge av en devaluering, og vi kan ikke si noe sikkert om hva som skjer med betalingsbalansen. Dette resultatet gjelder forøvrig bare dersom varene er bruttosubstitutter. Hvis etterspørselen etter K- og S-varer er uavhengig av hverandre, vil betalingsbalansen helt sikkert bli bedret ved en devaluering.

Med press i arbeidsmarkedet vil vi også kunne få usikre virkninger av en devaluering. Neary viser at hvis fritid og K-varer er brutto-substitutter, vil de indirekte virkningene av en devaluering godt kunne overskygge den direkte priseffekten, og vi kan få en forverring i betalingsbalansen.

I Nearys modell vil altså virkningen på betalingsbalansen kunne være kritisk avhengig av hvilken situasjon økonomien befinner seg i. Virkningen på sysselsettingen er derimot mye klarere: En devaluering vil gi økt sysselsetting enten der er keynesiansk eller klassisk arbeidsledighet i utgangspunktet.

Vi så at Dixit og Normans modell for en liten, åpen økonomi ga samme resultat som den enkle modellen vi har gjennomgått her. Dixit og Norman ser også på virkningene av en devaluering for en stor økonomi. En slik økonomi vil kunne bedre både sysselsetting og

betalingsbalanse ved å devaluere, men det kan bare skje på bekostning av sysselsettingen i utlandet. Et land kan med andre ord «eksportere» sin arbeidsledighet i denne modellen, og derved oppstår faren for konkurrerende devalueringer. Man kan bare være sikker på at en devaluering gir positive resultater hvis det forutsettes at utlandet ikke setter i verk mottiltak. Men andre land vil ha sterke incitamenten til å iverksette slike mottiltak, idet de får forverret både sysselsettingen og betalingsbalansen.

A v s l u t n i n g o m f a s t p r i s m o d e l l e r

Vi har sett at mulighetene er mange og varierte innen området fastprismodeller. Litteraturen er foreløpig ikke særlig omfattende, og alle de bidragene som er nevnt her, presiserer at det fremdeles gjenstår mye arbeid før vi har en tilfredsstillende teori for situasjoner med ikke-walrask likevekt. Vi har fått en indikasjon på hva slags resultater vi kan vente å finne, men samtidig har vi sett at tilsynelatende små endringer i modellstrukturen kan gi store endringer i resultatene. Man skulle f.eks. kanskje tro at en skjermet sektor ikke ville ha særlig sterk innvirkning på den eksterne balansen. Men vi har sett at en slik sektor kan ha stor betydning både for sysselsetting og betalingsbalanse. I og med at den skjermete sektor blir klarert ved kvantumsrasjonering snarere enn ved at prisene tilpasser seg til et likevektsnivå, vil nemlig det som skjer i denne sektoren ha betydning også for etterspørselen etter andre varer. Vi må pr. definisjon ha at etterspørsel er lik tilbud ex post i den skjermete sektor, men så lenge dette ikke er lik den ønskete mengde av disse varene, må vi allikevel ta hensyn til denne sektoren når vi skal modellere resten av økonomien. Vi kan ikke betrakte en modell hvor alle varer handles internasjonalt som en redusert form av et system som egentlig er mer omfattende.

Alle modellene vi har nevnt her, har forutsatt at prisene på varer som handles internasjonalt, er fleksible. Det har altså ikke vært noen avsetningsproblemer for den konkurranseutsatte industrien. Små land kan kjøpe og selge så mye de ønsker til en gitt pris, mens store lands handlinger vil påvirke prisene internasjonalt, dog hele tiden slik at der er likevekt på verdensmarkedet. Det som skaper problemer, er arbeidsmarkedet innenlands, og eventuelt et varemarked som er skjermet fra utenlandsk konkurranse. Dixit og Norman (1980) ser i tillegg på hva

som kan skje dersom det er rigide priser på varer som handles internasjonalt. Da er det tre markeder med faste priser, nemlig varemarked internasjonalt, og arbeidsmarked i hjemland og utland. Det gir i prinsippet 8 mulige fastprisregimer, avhengig av hvilken side som blir rasjonert i de ulike markedene. Dixit og Norman går ikke gjennom alle disse mulighetene, og de forsøker heller ikke å kartlegge regimene. De velger i stedet ut en situasjon med generell underskuddsetterspørrelse, og studerer dette regimet nærmere. Vi skal ikke gå videre inn på dette, men det kan f.eks. nevnes at virkningene av en devaluering blir svært uklare i denne modellen. Det er ikke umulig at en devaluering kan føre til lavere sysselsetting, selv ikke når vi ser på et lite land. Ellers er fremdeles muligheten for å «eksportere» arbeidsledigheten tilstede. Dixit og Norman presiserer at det er mye upløyd mark på dette området. De har bare plukket ut et tilfeldig regime og studert dette, mens en tilfredsstillende teori krever at man studerer forskjellige regimer, og dessuten kartlegger overgangene mellom regimene.

Steigum (1980) går litt videre i denne retningen, idet han studerer en modell hvor eksport kan være eksogent eller endogent bestemt, alt ettersom det er over- eller underskuddstilbud på verdensmarkedet.

Steigums modell har to innenlandske sektorer, nemlig en skjermet og en konkurranseutsatt, og dessuten åpnes muligheten for import av råmaterialer (f.eks. olje), som brukes i produksjonen i de to sektorene. Steigum fokuserer på spørsmål som har med sysselsettingen å gjøre, og han kartlegger de mulige arbeidsledighetsregimene som kan oppstå. Selv om ikke Steigum legger særlig vekt på betalingsbalansespørsmål, bekrefter også hans analyse inntrykk av at det er vanskelig å si noe generelt om virkninger på den eksterne balansen. Politiske inngrep kan ha forskjellig effekt avhengig av hvilket regime økonomien befinner seg i, og Steigums analyse viser at denne usikkerheten bare blir større når flere markeder innføres i modellen.

Nettopp denne usikkerheten med hensyn til virkninger av økonomisk-politiske inngrep, må sies å være et svakt punkt ved denne type modeller. At en økonomi kan befinne seg i ulike situasjoner, og at effekten av politiske virkemidler kan være forskjellig i disse situasjonene, vil vel de fleste kunne være enige om. Men når regimene blir mange, og det ikke kan gis noen enkel regel som sier hvilket fastprisregime en økonomi er i, så vil mange hevde at teorien ikke er god nok til å kunne

være til noen hjelp for den økonomiske politikk som skal drives. Teorien sier f.eks. at Keynes' oppskrift for økonomisk politikk bare vil ha den ønskete virkning gitt en spesiell type ulikevekt, mens andre inngrep er nødvendige hvis vi står overfor en annen slags ulikevekt. Dette er selvsagt nyttige kunnskaper å få fram, men så lenge det ikke kan gis mer generelle retningslinjer for hvordan ulike virkemidler vil påvirke økonomien til enhver tid, vil neppe disse nye kunnskapene få noen særlig praktisk betydning for den politikk som føres.

En mer fundamental innvending mot disse fastprismodellene går på måten arbeidsmarkedet modelleres på. Vi har forutsatt at den nominelle lønnen er rigid, og at reallønnen derved kan endres ved en prisendring. Dette er grunnen til at en devaluering har entydig positiv virkning i de fleste modellene. Det er imidlertid ikke særlig sannsynlig at arbeidstakerne er fornøyd med konstant nominell lønn når prisene stiger, og dermed kan mye av grunnlaget for de resultatene vi har kommet fram til, falle bort. Branson og Rotemberg (1980) mener å ha påvist at reallønnsrigiditet er et mer framtrædende trekk enn rigid nominell lønn, i hvert fall i europeiske land, og dette vil opplagt måtte ha stor betydning for måten vi modellerer økonomien på. Hvis ikke reallønnen kan endres, vil det i mange tilfeller kunne være vanskelig å bedre sysselsettingen ved hjelp av politiske inngrep. Under klassisk arbeidsledighet f. eks., er jo sysselsettingen nettopp begrenset av at bedriftene ikke ønsker å ansette flere arbeidere til den rådende reallønn, og hvis denne lønnen ikke kan reduseres, kan da heller ikke sysselsettingen bli forbedret. Det bør være en viktig oppgave å prøve å ta hensyn til slik reallønnsrigiditet i fremtidige fastprismodeller. Spesielt i tider med sterk prisstigning er det opplagt av sentral betydning å bringe på det rene hva som skjer i modellen når reallønnen holdes konstant, i stedet for at den nominelle lønnen er fast.

Et annet fenomen som bør innarbeides i fremtidige modeller, er muligheter for lagerhold. I praksis ser vi ofte at bedrifter som møter avsetningsvansker, produserer for lager snarere enn å stanse produksjonen og si opp arbeidsstokken. Videre vil man i tider med sterk etterspørsel kunne selge fra lager i stedet for å øke aktiviteten på kort sikt. Dette er forhold som helt klart vil kunne ha betydning for resultatene i den type modeller vi har sett på her.

Penger har vært det eneste finansielle aktivum i våre fastprismodel-

ler. Dette er urealistisk, og det er opplagt en svakhet ved modellene. Fra andre sammenhenger vet vi at hvordan kapitalmarkedet fungerer, kan ha stor innflytelse på hvordan resten av økonomien virker. Da er det lite tilfredsstillende å ha en teori hvor pengehold er den eneste mulige måten å overføre kjøpekraft til framtidige perioder. Vi vet at et vel fungerende kapitalmarked kan være til stor hjelp i en økonomi, mens et imperfekt kapitalmarked kan hindre en potensiell økonomisk utvikling, og det bør være en viktig oppgave å søke og inkorporere slike forhold i framtidige fastprismodeller. Dette punktet trekker forøvrig også Dixit og Norman (1980) fram som et viktig område for videre forskning.

Et annet viktig forskningsfelt er modellering av forventninger. Vi har f.eks. sett at folks pengebeholdning kan ha stor betydning for tilpasningen i alle markeder. Grunnen til at folk holder penger, er at de dermed har større konsummuligheter i senere perioder. Men da vil forventet pris på konsumvarer i senere perioder være av avgjørende betydning for hvor stor pengemengde man ønsker å overføre til disse periodene. På denne måten vil forventningsdannelsen ha direkte innvirkning på den økonomiske tilpasningen i inneværende periode. De fleste økonomer er enige om at forventninger er viktige for konsumenttilpasningen, og kanskje også for produsentenes tilpasning, men de færreste har gjort forsøk på å ta med forventninger i formelle modeller. Dette skyldes selvsagt at det er svært vanskelig å gi en tilfredsstillende formell beskrivelse av hvordan publikums forventninger dannes og virker. De forsøk som er gjort på å modellere forventninger, går ofte til ytterpunktene: Enten er folks forventninger helt statiske, eller så er de helt rasjonelle. En mellomting er det som kalles adaptive forventninger. Ingen av disse formuleringene gir noen tilfredsstillende framstilling av forventningsdannelse, men det er i hvertfall vist innen flere områder av økonomisk teori at valg av forventningsstruktur kan ha avgjørende betydning for hvordan økonomien fungerer. Når det gjelder fastprismodeller kan der være visse prinsipielle problemer med å ta hensyn til prisforventninger, idet det er en del av modellens natur at prisene er faste. Ikke desto mindre er det en kjensgjerning at forventningene kan være av stor betydning, og det må være en viktig oppgave for videre forskning på området å formulere modellene slik at man kan ta hensyn til forventninger.

For monetær betalingsbalanseteori refererte vi en rekke empiriske studier som var ment å bekrefte teorien. Noe tilsvarende finnes ikke for fastprismodeller. Det skyldes vel delvis at denne teoriretningen er nyere, og delvis at det kanskje ikke er så lett å formulere testbare hypoteser når vi opererer med mange regimer, og med ulike virkninger av forskjellige skift i de ulike regimer. Ideelt sett skulle man tro at det er mulig å formulere hypoteser som gjør at vi ved hjelp av empiriske studier skal kunne diskriminere mellom forskjellige regimer. Men dette er, såvidt jeg vet, foreløpig ikke forsøkt gjort, så også her har vi et område for framtidens forskning.

4. *Flytende valutakurs*

Innledningsvis ble det hevdet at det i prinsippet ikke er noen forskjell på modeller for faste og flytende valutakurser. Det er de samme forholdene som bør kartlegges, enten det er valutakursen eller betalingsbalansen som endres over tid. Etter denne innledningen har vi imidlertid stort sett bare konsentrert oss om modeller med fast valutakurs. Vi skal derfor nå kort avslutte med å se hvordan vi kan ta hensyn til flytende kurser i disse modellene. Til nå har vi sett på systemer med helt faste valutakurser. Det motsatte ytterpunkt er kurser som kan flyte fullstendig fritt. Dette er de systemene som har vært mest analysert i teorien, mens vi i praksis nesten aldri vil treffe på disse systemene i rendyrket form. De fleste land prøver å holde en viss kontroll med hvordan valutakursen utvikler seg, men de færreste, om noen, forsøker lenger å holde kursen helt fast. Siden vi nå allikevel har brukt så mye plass til å studere det ene av disse ytterpunktene, kan vi jo også ofre noen linjer til å se på det andre, og like urealistiske ytterpunkt.

Med fritt fluktuerende kurser vil disse i teorien hele tiden bevege seg slik at det er balanse i utenriksøkonomien. I de monetære modellene betyr dette at vi alltid har $\Delta R = 0$. I fastprismodellene betyr det at vi alltid befinner oss på kurven for balansert handel. Dette har opplagt betydning for virkningene av forskjellige politiske inngrep i økonomien, og vi har allerede nevnt hvordan finans- og pengepolitiske virkemidler får en annen effekt på sysselsettingen når kursene er flytende i våre fastprismodeller. I monetær betalingsbalanseteori så vi at myndighetene ikke hadde styring med pengemengden når valutakursen skulle holdes fast. Med fleksible kurser vil verdien av den internasjonale

komponenten av pengemengden, R , forbli konstant, og da kan myndighetene bestemme utviklingen i pengemengden i økonomien. Det ble hevdet at forsøk på aktiv pengepolitikk ikke ville ha noen langsiktig, realøkonomisk virkning, fordi pengetilbudet ville være endogent bestemt. Med flytende kurser er altså pengemengden eksogent bestemt, og da vil også pengepolitikk kunne ha realøkonomiske virkninger på lang sikt.

Med kontrollert flyting vil kursen kunne variere over tid, men myndighetene vil holde en viss kontroll med kursutviklingen. Da kan både betalingsbalanse og valutakurs være interessante størrelser. Mussa (1978) har studert et slikt regime med utgangspunkt i en monetær tilnærming. Han hevder at monetær betalingsbalanseteori, med enkle reformuleringer, egnert seg bra både i situasjoner med fritt fluktuerende kurs og med kontrollert flyting. Valg av valutasystem kan ha betydning for de resultatene som kommer fram i analysen, men selve modellapparatet blir det samme uansett system.

Kouri (1976) studerer en porteføljemodell i en situasjon med flytende valutakurs, og han peker på likheter og ulikheter mellom regimer med faste og flytende kurser. Der er en klar symmetri mellom regimene, idet vi med faste kurser har endogent pengetilbud og eksogen valutakurs, mens vi med flytende kurser har eksogent pengetilbud og endogen kurs. Av viktige forskjeller kan vi først og fremst nevne at med flytende kurser kan ulike land ha forskjellig inflasjonsrate på lang sikt. Dette er ikke mulig i modeller med fast valutakurs. Dessuten virker den prosessen som fører økonomien over til nye likevektspunkter, på forskjellige måter i de ulike regimer. Med faste kurser vil ny porteføljelikevekt bli oppnådd ved hjelp av kapitalbevegelser mellom land. Med fleksible kurser opprettholdes likevekten ved at verdsettingen av ulike aktiva endres. Ellers nevner Kouri et punkt som vi allerede har sett en del på, nemlig det at det i denne type monetære modeller ikke er opplagt at de løsninger som framkommer, er stabile. Med fritt fluktuerende kurser betyr dette at den likevektskursen som kommer fram i modellen, kan være ustabil.

En del framstillinger av teorier for regimer med flytende valutakurs, kan gi inntrykk av at disse er vesensforskjellige fra betalingsbalanseteorier for fastkursregimer (se f.eks. Kreinin og Officer (1978) når det gjelder monetær teori). I valutakursteorier legges det bl.a. ofte stor

vekt på inflasjonsforventninger. Men dette er ikke noen fundamental ulikhet. Poenget er bare at med faste kurser må inflasjonsutviklingen være lik i alle land, mens fleksible kurser åpner muligheten for å ha forskjellige inflasjonsrater i ulike land, og det er nettopp disse forskjellene i inflasjonen som trekkes fram som viktige for kursutviklingen.

Man skulle gjerne tro at tilhengere av monetær betalingsbalanse-teori, som setter så stor lit til prismekanismens virkning på realmarkedene, også skulle favorisere et system hvor prismekanismen får virke fritt på valutakursen. Dette er imidlertid ikke tilfelle. Mange framtrede talsmenn for monetær betalingsbalanseteori går inn for å ha et system med faste valutakurser i verden. Årsaken til det er at disse økonomene er opptatt av virkningene på lang sikt, og da vil deres modeller gi både intern og ekstern balanse uansett hvilket system som velges. Dermed bør man velge faste valutakurser fordi det vil redusere usikkerhet, og knytte hele verden sammen til ett marked. Hvis vi er opptatt av situasjonen på kort sikt, og også tillater reell ulikevekt i modellene, kan det imidlertid godt tenkes at konklusjonen vil bli en annen. Da kan fleksible valutakurser være et velegnet hjelpemiddel for å prøve å bringe økonomien i retning av Walras-likevekt. Vi har allerede sett at valutakursen kan ha realøkonomisk betydning i våre fastprismodeller, og en kartlegging av konsekvensene av fleksible kontra faste kurser i slike modeller, bør kunne være en viktig oppgave for videre arbeid innen dette feltet.

*Norges Handelshøyskole
Samfunnsøkonomisk Institutt*

REFERANSER

- Bean, D. L. (1976), «International Reserve Flows and Money Market Equilibrium: The Japanese Case» i *Frenkel og Johnson (1976)*.
- Branson, W. H. and Rotemberg, J. J. (1980), «International Adjustment with Wage Rigidity». *European Economic Review*, May.
- Dixit, A. (1978), «The balance of trade in a model of temporary equilibrium with rationing.» *Review of Economic Studies*, 45, 393—404.
- Dixit, A. K. and Norman, V. (1980), *Theory of International Trade*. Cambridge University Press, Cambridge.

- Fratianni, M. (1977), «A note on the theory of offsetting capital flows.» *Journal of Monetary Economics* 3, 133—138.
- Frenkel, J. A. and Johnson, H. G. (1976), *The Monetary Approach to the Balance of Payments*. Allen & Unwin, London.
- Frenkel, J. A. and Johnson, H. G. (1978), *The Economics of Exchange Rates: Selected Studies*. Addison-Wesley Publishing Company.
- Genberg, A. H. (1976), «Aspects of the Monetary Approach to the Balance-of-Payments Theory: An Empirical Study of Sweden» i *Frenkel og Johnson (1976)*.
- Geweke, J. (1978), «Testing the Exogeneity Specification in the Complete Dynamic Simultaneous Equation Model.» *Journal of Econometrics*, Apr., 163—185.
- Hahn, F. H. (1977), «The Monetary Approach to the Balance of Payments.» *Journal of International Economics*, 7, 231—249.
- Johannes, J. M. (1981), «Testing the Exogeneity Specification underlying the Monetary Approach to the Balance of Payments.» *The Review of Economics and Statistics*, Feb., 29—34.
- Kouri, P. (1976), «The Exchange Rate and the Balance of Payments in the Short Run and in the Long Run: A Monetary Approach.» *Scandinavian Journal of Economics*, 78.
- Kouri, P. and Porter, M. G. (1974), «International Capital Flows and Portfolio Equilibrium.» *Journal of Political Economy*, 82, 443—467.
- Kreinin, M. E. and Officer, L. H. (1978), *The Monetary Approach to the Balance of Payments: A Survey*. Princeton Studies in International Finance, no. 43, Princeton University, Princeton.
- Magee, S. P. (1976), «The Empirical Evidence on the Monetary Approach to the Balance of Payments and Exchange Rates.» *American Economic Review, Papers and Proceedings*.
- Malinvaud, E. (1977), *The Theory of Unemployment Reconsidered*. Basil Blackwell, Oxford.
- Mussa, M. (1978), «The Exchange Rate, the Balance of Payments, and Monetary and Fiscal Policy under a Regime of Controlled Floating» i *Frenkel og Johnson (1978)*.
- Neary, J. P. (1980), Non-traded Goods and the Balance of Trade in a Neo-Keynesian Temporary Equilibrium. *Quarterly Journal of Economics*.
- Neumann, M. J. M. (1978), «Offsetting Capital Flows. A reexamination of the German case.» *Journal of Monetary Economics*, 4, 131—142.
- Norman, V. og Wergeland T. (1978), *Konkurranssevne og næringsstruktur*, Bergen. (VHU-rapport nr. 1, SAF-NHH, 1978.)
- Rodriguez, C. A. (1976), «Money and Wealth in an Open Economy Income-Expenditure Model» i *Frenkel og Johnson (1976)*.
- Steigum, E. (1980), «Keynesian and Classical Unemployment in an Open Economy.» *Scandinavian Journal of Economics*, 82, 147—166.
- Zecher, J. R. (1976), «Monetary Equilibrium and International Reserve Flows in Australia» i *Frenkel og Johnson (1976)*.

A TWO-PERIOD MODEL OF TEMPORARY
EQUILIBRIUM WITH MONOPOLISTIC COMPETITION

A TWO-PERIOD MODEL OF TEMPORARY
EQUILIBRIUM WITH MONOPOLISTIC COMPETITION

INTRODUCTION

In Haaland (1982)¹⁾ I studied employment- and balance of payment-situations in a simple model of a small, open economy, in which all commodities were traded internationally. The structure of the model was very close to that of simple fixed-price models for such economies, the only major difference being that in my model the production side is characterized by monopolistic competition. In this paper, I will extend the analysis and introduce some new features.

Usually, a 'small country'-assumption is taken to imply that all agents in the economy are facing given world-market prices. Thus, implicitly one assumes that commodities from different producers are perfect substitutes, i.e. the goods are homogeneous. In my model the economy is still small, and each producer is also small, but commodities are heterogeneous. Each firm produces a unique product; there may be more or less close substitutes, but there are no perfect substitutes, and it is possible to identify a decreasing demand curve for each commodity. This way of modelling the economy gives room for an analysis of the importance of changing demand- and supply-conditions, while the usual 'small country'-assumption implies that demand for goods from our home-country on the world market is perfectly elastic.

In the present paper the analysis will be extended in that we explicitly allow for intertemporal optimization both on the consumption and the production side of the economy. Thus, demand and supply today may be influenced by the expected situation tomorrow, and we will try to explore some possible effects of changing expectations.

Our model is a two-period one, and the consumers' behaviour in the two periods is linked together by the possibility of carrying money between the periods. (As we implicitly assume a perfect

1) Written in Norwegian.

capital market, the consumers may also hold a non-positive amount of money from one period to the next, i.e. it is possible to borrow money.) On the production side of the economy, the two-period feature allows the firms to invest or to build up inventories whenever their expectations to the future make such actions profitable. A theory of optimal investments will be developed, and it will be used in tracing out temporary equilibrium situations.

The focus will throughout be on what happens in the first period. Thus, the purpose of using a two-period model, is not to establish dynamic properties in the economy. In our context, the future is only interesting as long as the expectations to the future economic situation influence the present temporary equilibrium conditions. In this way, the approach is close to that of Neary and Stiglitz (1983). There are, however, some major differences from their approach. For one thing, we will study an open economy, while their model was of a closed one. Further, in my model there is more room for flexibility both in prices and quantities; thereby I am avoiding all kinds of commodity-rationing. And finally, the supply-side of our economy is characterized by monopolistic competition, rather than by price-taking firms.

THE MODEL

All commodities in the model are traded internationally. There is a large number of firms, but due to the heterogeneity of the products, each firm may, within certain limits, determine its own prices and quantities. The demand conditions and profit possibilities will obviously be influenced by the behaviour of other firms in the industry, but, nevertheless, there will be some scope for individual price adjustments. We will study the optimal behaviour of one representative firm. Assuming that the number of firms in an industry is constant, i.e. there is no entry to or exit from the industry, it should cause no particular

problems to restrict the analysis to one firm.¹⁾ In the same way, we will study optimal consumption by looking at the behaviour of one representative consumer.

The 'small country'-assumption must be given a somewhat different meaning in this context, compared to the usual one. Instead of facing fixed world-market prices, the agents in our economy are facing given macroeconomic conditions abroad. Whatever the producers or consumers in the economy do, this does not influence the general economic situation abroad. Thus, foreign income, employment, and supply- and demand-conditions for other commodities than the home-produced ones, are not influenced by the activities in our small economy. Further, on the consumption side the country is small in the sense that one may import as much foreign goods as wanted at exogeneously given prices. How these prices are decided, does not really matter for the analysis; the important point is that whatever happens inside our economy, the effects are too small to cause changes in the prices on foreign commodities.

In the rest of the paper we will first study consumption and production separately. Thereafter we will study a number of different possible temporary equilibrium situations, all the time focussing on employment and balance of trade in the short run.

Consumption

There is one representative consumer. He takes prices and income as given, and he consumes goods today (period 1) and in the future (period 2). Each period he consumes two (aggregated) products, home-produced goods (h) and foreign goods (f). Thus he buys four different goods: c_{h1} , c_{f1} , c_{h2} , c_{f2} . The quantities demanded are found by solving

1) See Haaland (1982) for a more thorough discussion of aggregation problems.

$$(1) \quad \begin{cases} \max U(u^1(c_{h1}, c_{f1}), u^2(c_{h2}, c_{f2})) \\ \text{s.t. } \sum_i p_i c_i \leq y_1 + y_2 + \bar{m} \end{cases}$$

where y_i is income in period i ¹⁾, and \bar{m} is the initial stock of money. The solution to (1) can be written as

$$(2) \quad e(p_{h1}, p_{f1}, p_{h2}, p_{f2}, u) = y_1 + y_2 + \bar{m}$$

where $e(\cdot)$ is the consumer's expenditure function.

The utility function in (1) is separable between the periods. The functions U , u^1 and u^2 are ordinary utility functions, and I will assume that all goods are (net) substitutes. Let us further assume that u^1 and u^2 are homothetic functions. That implies that relative consumption in each period (c_{hj}/c_{fj}) only depends on relative prices in that period (p_{hj}/p_{fj}). Thus the ratio of demand for goods in period 2 will be independent both of income and of prices in period 1. But this makes it possible to represent consumption in period 2 by an aggregate quantity e_2 and an aggregate expected price level p_2 .²⁾ We may then rewrite the expenditure function in (2) as

$$(3) \quad e(p_{h1}, p_{f1}, p_2, u) = y_1 + y_2 + \bar{m} \equiv y.$$

Partial derivatives of e w.r.t. prices give compensated demand functions, and e is linearly homogeneous in all prices.

-
- 1) All values concerning the future are present values, i.e. y_2 , p_{h2} and p_{f2} are discounted. The interest rate is exogenously given.
 - 2) Letting subscript j indicate partial derivative of e w.r.t. p_j , we have:

$$(i) \quad \frac{\partial (e_{h2}/e_{f2})}{\partial u} = 0, \quad (ii) \quad \frac{\partial (e_{h2}/e_{f2})}{\partial p_{i1}} = 0 \quad i = h, f.$$

(i) follows from the homothetic utility functions, while (ii) follows from the separability. (i) and (ii) correspond to the Leontief aggregation conditions.

If $v(p_{h1}, p_{f1}, p_2, y)$ is the indirect utility function, the uncompensated demand functions are given by

$$(4) \quad c^j(p_{h1}, p_{f1}, p_2, y) = \frac{\partial}{\partial p_j} e(p_{h1}, p_{f1}, p_2, v(p_{h1}, p_{f1}, p_2, y))$$

$i = h1, f1, 2$

(4) will be the basic expression for domestic demand functions in this paper.

Using (4) we may study the effects on demand for goods $h1$ when p_{h1} , p_{f1} or p_2 change. We get

$$(5) \quad c_j^{h1} = e_{h1,j} + e_{h1,u} \cdot v_j$$

$$= e_{h1,j} - c_y^{h1} \cdot c^j$$

where subscript j , u and y indicate partial derivatives w.r.t. p_j , u and y , respectively. (5) is, of course, the Slutsky equation.

From (5) we get $c_{h1}^{h1} < 0$, while c_{f1}^{h1} and c_2^{h1} may have either sign, depending on whether the substitution effect or the income effect is the bigger. Assuming gross substitution will ensure $c_{f1}^{h1} > 0$ and $c_2^{h1} > 0$, but this is a strong assumption, and we shall make this assumption only when it is necessary.

The demand for home-goods from abroad is the result of the same kind of consumer behaviour. We may describe the optimization problem with

$$(6) \quad E(p_{h1}, p_{f1}, p_2, U) = Y$$

(capital letters will always indicate foreign prices and quantities). Thus we get

$$C^{h1}(p_{h1}, p_{f1}, p_2, Y) = E_{h1}(p_{h1}, p_{f1}, p_2, V(p_{h1}, p_{f1}, p_2, Y)).$$

The small country assumption implies that all foreign figures are exogeneously given, independent of what happens in the home country. Thus a change in P_{hl} will not have any effects on P_{f1} , P_2 or V , and we may write $C_{hl}^{hl} = E_{hl,hl}$. On the other hand, we cannot ignore the income effects when we study changes in P_{f1} or P_2 , because goods C_{f1} and C_2 may have dominating positions in the expenditures of the foreign consumer.

Production

Each firm produces a unique product; there may be more or less close substitutes, but it is possible to identify a falling demand curve for each product. It must be emphasized that these demand curves exist due to the heterogeneity of the goods, and not because the producers are large relative to the market. On the contrary, each firm is small, and it has no power to influence macroeconomic magnitudes. Nevertheless, the firm is able to vary its prices within a certain range, and it sets the prices so as to maximize expected profits. Thus, in fact the firms behave as monopolists, and as we have a two-period model, we have to study optimal monopolistic behaviour over two periods.

Our (representative) firm sells its product in two markets, the home market, and abroad. The perceived demand functions in period i , are

$$(7) \quad p_i(x_i) = \gamma_i x_i^{a-1} \quad 0 < a < 1$$

$$(8) \quad \varepsilon P_i(X_i) = \varepsilon \Gamma_i X_i^{A-1} \quad 0 < A < 1$$

where p_i and x_i are price and quantity at home, while P_i and X_i are price and quantity abroad. ε is the exchange rate. These simple relations are based on the assumption that the firm expects all prices except its own, to be constant (this is more thoroughly discussed in Haaland (1982)). If many or all firms adjust their prices simultaneously, this will probably change the γ_i and $\varepsilon \Gamma_i$, and the relations between prices

and quantities will not be as in (7) and (8). Nevertheless, it is not irrational of the firm to use (7) and (8) in its planning, because it has no better alternatives. Thus these demand functions will be used in deciding the optimal behaviour of the firm, but when studying aggregate equilibrium situations, we will allow deviations from these simple relations.

The monopolist maximizes the profit

$$(9) \quad \pi = \pi_1 + \pi_2$$

π_i is profit in period i ¹⁾, and we have

$$(10) \quad \pi_i = p_i(x_i) \cdot x_i + \varepsilon P_i(X_i) \cdot X_i - w_i \ell_i \quad i = 1, 2.$$

w_i is the (exogeneously given) wage rate in period i , and ℓ_i is the firm's demand for labour in that period. Production is given by the functions

$$(11) \quad x_1 + X_1 = h(\ell_1, I) \quad h_\ell > 0, h_I < 0$$

$$(12) \quad x_2 + X_2 = g(\ell_2, I) \quad g_\ell > 0, g_I > 0$$

where I is investment or inventories held over from period 1 to period 2. Thus labour ℓ_1 is used partly to produce the goods which are sold ($x_1 + X_1$) and partly to produce investment goods, I . To simplify we shall use $h(\ell_1, I) = f(\ell_1) - I$, i.e. we assume $h_I = -1$, $h_{\ell I} = 0$ and $h_{II} = 0$. Further, we have the following properties

$$f'(\ell_1) > 0, f''(\ell_1) \leq 0$$

$$g_\ell > 0, g_I > 0, g_{\ell\ell} < 0, g_{II} < 0, g_{\ell I} \geq 0.$$

The investment, I , is the only reason why we have to study the firm's optimization as a two-period problem. Optimal investment decisions will obviously depend on expectations concerning

1) All future values are discounted by an exogeneously given interest rate.

market conditions and costs in the future, as well as costs and demand today.

We shall start by studying behaviour in period 2 given an investment I from period 1. Using (7), (8), (10) and (12), we may characterize the solution to the optimization problem in period 2 by the profit function

$$(13) \quad \begin{aligned} \pi_2^* &= \max_{x_2, X_2, \ell_2} \{ \gamma_2 x_2^a + \varepsilon \Gamma_2 X_2^A - w_2 \ell_2 \mid x_2 + X_2 = g(\ell_2, I) \} \\ &= \pi^2(\gamma_2, \varepsilon \Gamma_2, w_2, I) \end{aligned}$$

(the elasticities a and A will be kept unchanged, and these are therefore suppressed in (13)). (13) may be treated as an ordinary profit function, except from the fact that we cannot use prices as arguments, since the prices are set endogeneously. We use instead γ_2 and $\varepsilon \Gamma_2$, which are the exogeneously given arguments in the perceived demand functions.

The profit function $\pi^2(\cdot)$ is linearly homogeneous in γ_2 , $\varepsilon \Gamma_2$ and w_2 , and it is worth noting the following properties

$$(14) \quad -\pi_{w_2}^2 = \ell_2$$

$$(15) \quad \pi_I^2 = w_2 \cdot \frac{g_I(\ell_2, I)}{g_\ell(\ell_2, I)}.$$

(14) is the (notional) demand for labour by this firm, while (15) gives the marginal value of the investment, I .

Abstracting from aggregation problems, we shall use (14) as an expression for the aggregate demand for labour in the economy. The supply of labour is exogeneously given as $\bar{\ell}_2$. If $-\pi_{w_2}^2 \leq \bar{\ell}_2$, the firm is unconstrained in the labour market, and its behaviour is characterized by (13). In that case, the employment is given by (14). If, on the other hand, $-\pi_{w_2}^2 > \bar{\ell}_2$, the firm expects to face a labour constraint in the future, and its

optimal behaviour has to be recalculated. This is best done by defining and utilizing what we may call the "shadow wage".¹⁾ We have the constrained profit function $\bar{\pi}^2$

$$(16) \quad \begin{aligned} \bar{\pi}^2(\gamma_2, \varepsilon\Gamma_2, w_2, I; \bar{\ell}_2) &= \max\{\pi^2(\gamma_2, \varepsilon\Gamma_2, w_2, I) \mid \ell_2 \leq \bar{\ell}_2\} \\ &= \pi^2(\gamma_2, \varepsilon\Gamma_2, \bar{w}_2, I) + (\bar{w}_2 - w_2)\bar{\ell}_2 \end{aligned}$$

where the shadow wage \bar{w}_2 , is implicitly defined by

$$-\pi_{w_2}^2(\gamma_2, \varepsilon\Gamma_2, \bar{w}_2, I) = \bar{\ell}_2$$

i.e. \bar{w}_2 is the wage rate that would have given exactly full employment. From (16) we get

$$\bar{\pi}_I^2(\gamma_2, \varepsilon\Gamma_2, w_2, I; \bar{\ell}_2) = \pi_I^2(\gamma_2, \varepsilon\Gamma_2, \bar{w}_2, I)$$

i.e. the marginal value of I , when the firm expects to face a labour constraint, can be calculated from the unconstrained profit function if this is evaluated at the shadow wage rate \bar{w}_2 . It must, of course, not be forgotten that \bar{w}_2 is endogeneously decided, and thus is a function of the other arguments in $\pi^2(\cdot)$.

Returning to the two-period optimization problem, we may rewrite this using (13) or (16) for the expected profit in period 2. Whether (13) or (16) is to be used depends on the expected situation in the labour market in the future. In general we have the maximization problem

$$(17) \quad \begin{aligned} \max_{x_1, X_1, \ell_1, I} \quad & \gamma_1 x_1^a + \varepsilon\Gamma_1 X_1^A - w_1 \ell_1 + \pi_2^* \\ \text{s.t.} \quad & x_1 + X_1 + I = f(\ell_1) \\ & \ell_1 \leq \bar{\ell}_1 \end{aligned}$$

1) This is equivalent to what Neary and Stiglitz (1983) call the "virtual price", or in our case, the "virtual wage", but I prefer to use "shadow wage".

$$(18) \quad \pi_2^* = \begin{cases} \pi^2(\gamma_2, \varepsilon\Gamma_2, w_2, I) & \text{if } -\pi_w^2 \leq \bar{\ell}_2 \\ \bar{\pi}^2(\gamma_2, \varepsilon\Gamma_2, w_2, I; \bar{\ell}_2) & \text{if } -\pi_w^2 > \bar{\ell}_2. \end{cases}$$

It should be remembered that γ_2 , Γ_2 and w_2 are discounted values; homogeneity of the profit function then ensures that discounted profit can be written as in (18).

From (17) the monopolist calculates his optimal prices and quantities. The actual demand in the market may, however, very well deviate from what the firm expects. As mentioned, the perceived demand functions are based on the assumption that all other prices are kept constant, and this assumption will typically not be fulfilled. It then has to be decided how the firm reacts to such deviations from its plans. We shall assume that the firm calculates the optimal period 1 prices from (17), and that once these prices are set, they will be kept constant during the first period. At these prices the firm then supplies as much goods as are actually demanded. Thus we assume a certain price rigidity, in that once the prices are set, they cannot be changed until the next period. In addition to setting the prices, the firm decides on the optimal investment, I .

From (17) the first order conditions for price and investment behaviour are easily found to be

$$(19) \quad p_1 \cdot a = \frac{w_1}{f'(\ell_1)}$$

$$(20) \quad \varepsilon P_1 \cdot A = \frac{w_1}{f'(\ell_1)}$$

$$(21) \quad \pi_I^2 = \frac{w_1}{f'(\ell_1)}$$

In Haaland (1982) possible effects of price discrimination between the markets were studied. In the present paper we will simplify by assuming equal (perceived) demand elasticity in the two markets, i.e. $a = A$, implying that $p_1 = \varepsilon P_1$.

(19) and (20) then yield optimal prices as a markup over marginal costs. (21) states that the expected, discounted marginal value of I in period 2 must be equal to the marginal costs in period 1, in optimum.

To simplify further, it will be assumed that marginal costs in period 1 are constant, i.e. $f''(\ell_1) = 0$. This is a strong assumption, but as the firm faces decreasing demand curves, there is no need for rising marginal costs to decide the optimal behaviour. Given this assumption then, the period 1 price will be a simple function of the wage rate

$$(22) \quad p_1 = \varepsilon P_1 = \frac{w_1}{af'(\ell_1)} \equiv k_1 \cdot w_1,$$

where k_1 is a constant factor. (22) applies as long as the firm is not constrained in the labour market in period 1. We will return to the situation with labour constraints in period 1 later.

The constant marginal cost-assumption also simplifies the study of optimal investment behaviour. Two different situations have to be studied, depending on whether the firm expects to face a labour constraint in the future or not. If there are no expected future constraints, we have

$$\pi_I^2(\gamma_2, \varepsilon \Gamma_2, w_2, I) = \frac{w_1}{f'(\ell_1)}$$

which yields

$$(23) \quad I = I(\gamma_2, \varepsilon \Gamma_2, w_1, w_2)$$

+ + - +

where the signs of the partial derivatives are indicated.¹⁾

1) The only sign that may be ambiguous is that of I_{w_2} . A rise in w_2 implies reductions both in the production and in the quantities sold in period 2, and the sign of I_{w_2} depends on which of these reductions is the bigger. We shall assume $I_{w_2} > 0$.

The $f''(\ell_1) = 0$ assumption implies that $I(\cdot)$ is homogeneous of degree 0 in all its arguments. (Without this assumption the optimal investment would depend on demand conditions in period 1 as well, and it might be difficult to find a simple I -function.)

Finally, if the firm expects a labour constraint in period 2, the investment condition is given by

$$\pi_I^2(\gamma_2, \varepsilon\Gamma_2, \bar{w}_2, I) = \frac{w_1}{f'(\ell_1)}$$

where the shadow wage \bar{w}_2 is endogeneously decided. We get

$$(24) \quad I = \bar{I}(\gamma_2, \varepsilon\Gamma_2, w_1).$$

+ + -

Given the assumptions above, $\bar{I}(\cdot)$ will also be homogeneous of degree 0, and the following properties might be worth noting

$$\bar{I}_{\gamma_2} > I_{\gamma_2} > 0, \quad \bar{I}_{\varepsilon\Gamma_2} > I_{\varepsilon\Gamma_2} > 0, \quad 0 > \bar{I}_{w_1} > I_{w_1}.$$

The pricing rule given in (22) and the investment function in (23) or in (24) will be our basic output from the firm's optimization problem. The only deviation from this will be in the case of labour supply being a constraint in period 1. In that case, to which we shall return, a pricing-rule that is such that it clears the goods markets, will be introduced. This amounts to using the period 1 shadow wage rate in (22)-(24), instead of using the actual w_1 .

Expectations

So far both present and future income and prices have been considered as known parameters in the agents' optimization problems. Before solving the model, we have to discuss in more detail how these expectations come to be as they are. There is, of course, a lot of different possibilities when it comes to setting expectations, and only a few of these possibilities will be considered in this paper.

As far as the present period is concerned, it will throughout be assumed that the consumers use the realized prices and income in their planning, i.e. there will be no deviation from optimum due to lack of knowledge as to what the present income is, for instance. The period 1 price on home-made goods is given by (22), while the foreign goods have an exogeneously given price P_{f1} in foreign currency, or $p_{f1} = \epsilon P_{f1}$ in home currency. Turning to income, it is assumed that profits are distributed to the consumers once they arise, thus income is the sum of labour income and profits in the period. Income may be expressed either as the value of the quantity sold during the period, or as the value of the production less the value of the investments done.¹⁾

$$\begin{aligned} y_1 &= p_{h1}x_{h1} + \epsilon P_{h1}X_{h1} \\ &= p_{h1}[f(\ell_1) - I(\gamma_2, \epsilon \Gamma_2, w_1, w_2)] \end{aligned}$$

where the notation is slightly changed, to be in accordance with that from the consumption section. Subscript h and f will throughout indicate home and foreign produced commodities, while the use of small or capital letters is determined by whether the price or quantity in question refers to the home-market or abroad. To simplify the notation further, I will suppress the period 1 subscript whenever it is unnecessary. Thus, instead of writing h1 and f1, we simply use h and f.

As to period 2, our consumer expects something about p_2 and y_2 , while the firm has to have an opinion about γ_2 , Γ_2 and w_2 . These expectations may be important for the present economic situation, and they should be carefully considered in tracing out the equilibrium conditions. In principle there are two different systems, depending on whether the expectations are exogeneously or endogeneously decided. Exogeneous expectations will be used in most of this paper, but we will, of course, allow for shifts in the expected figures. Towards the end of the paper, possible consequences of letting expectations be decided endogeneously, will be discussed briefly.

1) This follows from (10), where π_1 is defined as a cash-flow concept. This influences the timing of the income-effects of building up inventories.

EXOGENEOUS EXPECTATIONS

In this section we will study employment and balance of payments situations when the agents' expectations are exogeneously given. The aim is to trace out a locus in the (w_1, P_f) -space, along which there is full employment in period 1, and another locus, along which there is balanced trade. Comparative-static properties of these loci will be established.

Above, it was shown that the firm's investment behaviour depends on the expected conditions in the future labour market. Optimal investment is given either by $\bar{I}(\gamma_2, \epsilon\Gamma_2, w_1)$ or by $I(\gamma_2, \epsilon\Gamma_2, w_1, w_2)$, depending on whether the firm expects a labour constraint, or not. In principle, we thus have two different systems of equations for period 1-equilibrium, and we may have to calculate the loci in question twice. In practice, however, the difference between $I(\cdot)$ and $\bar{I}(\cdot)$ is not that great, and it will be sufficient to calculate the solutions once. $I(\cdot)$ and $\bar{I}(\cdot)$ differ only in the magnitude of the partial derivatives, while the signs of these are the same. We will generally use $I(\gamma_2, \epsilon\Gamma_2, w_1, w_2)$ as our investment function, but whenever it makes any difference, the use of $\bar{I}(\gamma_2, \epsilon\Gamma_2, w_1)$ will be discussed.

Full employment

w_1 and P_f are exogeneously given to the agents in our economy. The actual pair (w_1, P_f) may yield unemployment, or pressure in the labour market, or, by chance, it may yield exactly full employment. Our first aim is to find all the combinations of w_1 and P_f that yield exactly full employment. For this to be the case, the following system of equations must be satisfied:

$$(25) \quad c^h(p_h, p_f, p_2, y) + C^h(P_h, P_f, P_2, Y) + I(\gamma_2, \epsilon\Gamma_2, w_1, w_2) = f(\bar{\ell}_1)$$

$$(26) \quad p_h = \epsilon P_h = \frac{w_1}{af'(\bar{\ell}_1)} \equiv k \cdot w_1$$

$$(27) \quad p_f = \epsilon P_f$$

$$(28) \quad y = p_h \cdot [f(\bar{\ell}_1) - I(\gamma_2, \varepsilon \Gamma_2, w_1, w_2)] + y_2 + \bar{m}$$

$$(29) \quad Y = P_f \cdot C_f + Y_2 + \bar{M}$$

We have six equations in the seven unknown; p_h , P_h , p_f , P_f , y , Y and w_1 . (25) is the labour market equilibrium condition, stating that consumer demand plus demand for investment goods should be equal to the full employment production at the going prices and wage rate. These prices are, on the other hand, set according to the rules in equations (26) and (27). (28) states one way of expressing the total domestic income ($y = y_1 + y_2 + \bar{m}$). By assumption, it is only y_1 that is endogeneously decided; y_2 and \bar{m} are exogeneously given, but we will study effects of exogenous shifts in these variables. Finally (29) is a possible expression of foreign income. Due to the small country-assumption, Y is independent of any home country figures. Nevertheless, we cannot ignore the influence on Y of changes in the foreign price level P_f , and to make the treatment as simple as possible, it will be assumed that C_f , Y_2 and \bar{M} are exogeneously given in (29). This may e.g. be the result of assuming full employment abroad (for a fuller discussion, see Haaland (1982)).

Using (26), (27) and (29), we may rewrite (25) and (28) as

$$(25') \quad c^h(kw_1, \varepsilon P_f, p_2, y) + C^h\left(\frac{k}{\varepsilon}w_1, P_f, P_2, P_f C_f + Y_2 + \bar{M}\right) + I(\gamma_2, \varepsilon \Gamma_2, w_1, w_2) = f(\bar{\ell}_1)$$

$$(28') \quad y = kw_1 \cdot [f(\bar{\ell}_1) - I(\gamma_2, \varepsilon \Gamma_2, w_1, w_2)] + y_2 + \bar{m}$$

Now, letting P_f be given from abroad, we here have two equations to be solved for the full employment wage-rate and income-level at home. Differentiating (25') and (28'), the solution may be written as

$$(30) \quad \begin{bmatrix} dw_1 \\ dy \end{bmatrix} = \frac{1}{D} \begin{bmatrix} -1 & -c_y^h \\ -(\frac{y_1}{w_1} - kw_1 I_{w_1}) & kc_h^h + \frac{k}{\varepsilon} C_h^h + I_{w_1} \end{bmatrix} \times$$

$$\begin{bmatrix} -(\varepsilon c_f^h + C_f^h + C_Y^h C_f^f) dP_f - I_{\gamma_2} d\gamma_2 - I_{\varepsilon \Gamma_2} \varepsilon d\Gamma_2 + 0d\bar{m} + 0dy_2 \\ 0 \quad dP_f + p_h I_{\gamma_2} d\gamma_2 + p_h I_{\varepsilon \Gamma_2} \varepsilon d\Gamma_2 - 1d\bar{m} - 1dy_2 \\ - (P_f c_f^h - \frac{kw_1}{\varepsilon} C_h^h + I_{\varepsilon \Gamma_2} \Gamma_2) d\varepsilon - c_2^h dp_2 - I_{w_2} dw_2 \\ + p_h I_{\varepsilon \Gamma_2} \Gamma_2 d\varepsilon + 0dp_2 + p_h I_{w_2} dw_2 \end{bmatrix}$$

where D is the determinant of the first matrix on the right hand side. The sign of D is of great importance. We have

$$D = -\frac{k}{\varepsilon} C_h^h - I_{w_1} (1 - p_h c_y^h) - \frac{1}{w_1} (p_h c_h^h + y_1 c_y^h).$$

All terms, except $-\frac{1}{w_1} y_1 c_y^h$, are positive. From the homogeneity of the c^h -function, we get

$$-(p_h c_h^h + y_1 c_y^h) = p_f c_f^h + p_2 c_2^h + (y_2 + \bar{m}) c_y^h.$$

Thus, assuming all commodities to be gross substitutes (GS), is a sufficient condition to ensure that this expression is positive, thereby ensuring $D > 0$.

$D > 0$ turns out to be a stability condition in this system. It is easily seen that $D > 0$ if and only if the sum $c^h + C^h + I$ decreases as w_1 (and thereby p_h) rises, i.e. $D > 0$ is equivalent to $dl_1/dw_1 < 0$. Without this condition satisfied, any temporary equilibrium that might occur, will be unstable. Thus, we will require $D > 0$. Above, it was shown that GS is a sufficient condition to ensure this stability. GS is, however, far from

necessary, and without exploring all possibilities, we will study one alternative expression for D. Using (5) and $y_1 = p_h c^h + \varepsilon P_h C^h$, we get

$$(31) \quad D = -\frac{k}{\varepsilon} E_{hh} - k c_y^h C^h - k e_{hh} - I_{w_1} (1 - p_h c_y^h).$$

This implies that price-elastic demand for h-commodities from abroad, is sufficient to ensure $D > 0$. Generally (31) shows that the more elastic the demand for h-goods is at home and abroad, the greater is D. Further, the more sensitive I is to changes in w_1 , the greater is D. Remembering that $-\bar{I}_{w_1} < -I_{w_1}$, we thus see that an expected labour constraint in the future, influences the present equilibrium through yielding a smaller D.

Now, having established that we must require $D > 0$, we will use (30) to trace out the full employment locus (FE):

$$(32) \quad \left. \frac{dw_1}{dP_f} \right|_{FE} = \frac{1}{D} (\varepsilon c_f^h + C_f^h + C_Y^h C^f) \\ = \frac{1}{D} [\varepsilon (e_{hf} - e_y^h c^f) + E_{hf}].$$

GS between h and f at home, is sufficient to ensure that FE is an increasing function in the (w_1, P_f) -space, as the income effects abroad vanish. On the other hand, lack of GS at home, may very well yield a decreasing FE-locus. Anyhow, there will be unemployment (U) above this locus, and labour constraints (LC) below it. We will throughout this paper assume that there is sufficient substitutability to ensure a rising FE-locus.

Using (32) and an appropriate expression for D, we get

$$(33) \quad \left. \frac{dw_1}{dP_f} \right|_{FE} = \frac{w_1}{P_f} - \frac{1}{DP_f} [p_2 e_{h2} - c_y^h b + P_2 E_{h2} - w_1 I_{w_1} (1 - p_h c_y^h)]$$

where b is the balance of payments surplus (to be defined below). The expression in the brackets is positive, at least as long as

b is not too big. (33) thus shows that the elasticity of w_1 w.r.t. P_f , is less than 1. These results are illustrated in fig. 1.

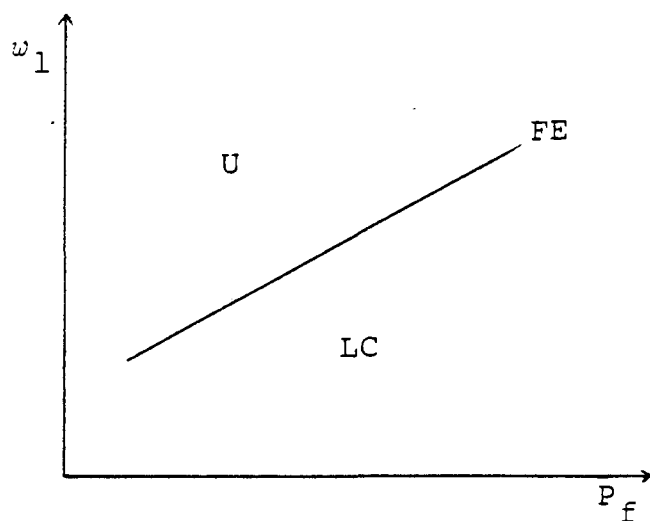


Fig. 1

(32) and (33) yield the following properties of the FE-locus:

- The stronger the substitution effects between h and f are, the more will $\left. \frac{dw_1}{dP_f} \right|_{FE}$ approach $\frac{w_1}{P_f}$, i.e. the closer will our results be to those of simple fixed-price models for small, open economies.
- Rising substitutability between h and 2 tends to yield flatter FE-locus.
- The higher $-I_{w_1}$ is, the flatter is FE. E.g. $\bar{I}(\cdot)$ yields a steeper FE than $I(\cdot)$ does.

Turning to the income effects, we find

$$\begin{aligned}
 \left. \frac{dy}{dP_f} \right|_{FE} &= \frac{1}{D} \left(\frac{y_1}{w_1} - p_h I_{w_1} \right) (\epsilon_c^h + C_f^h + C_Y^h C^f) \\
 (34) \qquad \qquad &= \frac{\partial y_1}{\partial w_1} \left. \frac{dw_1}{dP_f} \right|_{FE}
 \end{aligned}$$

where $\frac{\partial y_1}{\partial w_1} = \frac{y_1}{w_1} - p_h I_{w_1} > 0$. Thus the above discussion of

dw_1/dP_f applies to dy/dP_f as well, and the total income y increases in moving upwards along FE.¹⁾

Using (30) it is easy to establish comparative-static effects on FE of changes in the exogeneously given variables. A money expansion yields

$$(35) \quad \left. \frac{dw_1}{d\bar{m}} \right|_{FE} = \frac{c_y^h}{D}$$

$$(36) \quad \left. \frac{dy}{d\bar{m}} \right|_{FE} = 1 + \frac{\partial y_1}{\partial w_1} \cdot \left. \frac{dw_1}{d\bar{m}} \right|_{FE}$$

i.e. the FE-locus shifts upwards, and there is an income increase in addition to the original $d\bar{m}$.

The effects of a devaluation ($d\varepsilon > 0$) are

$$(37) \quad \left. \frac{dw_1}{d\varepsilon} \right|_{FE} = \frac{1}{D} [P_f c_f^h - \frac{kw_1}{\varepsilon^2} C_h^h + I_{\varepsilon \Gamma_2} \cdot \Gamma_2 (1 - p_h c_y^h)]$$

$$(37') \quad = \frac{w_1}{\varepsilon} - \frac{1}{\varepsilon D} [-(I_{\varepsilon \Gamma_2} \varepsilon \Gamma_2 + I_{w_1} w_1) (1 - p_h c_y^h) + p_2 e_{h2} - c_y^h b]$$

$$(38) \quad \left. \frac{dy}{d\varepsilon} \right|_{FE} = -p_h I_{\varepsilon \Gamma_2} \Gamma_2 + \frac{\partial y_1}{\partial w_1} \cdot \left. \frac{dw_1}{d\varepsilon} \right|_{FE}$$

(37) restates the by now familiar result that GS is a sufficient, but not a necessary, condition to ensure clear-cut effects. If h- and f-goods are GS at home, we know for certain that a devaluation will cause an upward shift in FE. Using (33), we may,

1) A part of this income increase is, however, a result of the way we model income expectations, in that a reduction in I increases period 1 income, y_1 , while the expected future income is not influenced.

however, get a somewhat weaker condition, as it is easily shown that

$$\left. \frac{dw_1}{d\varepsilon} \right|_{FE} > \frac{P_f}{\varepsilon} \cdot \left. \frac{dw_1}{dP_f} \right|_{FE} .$$

Thus, whenever we assume the FE-locus to be increasing, a devaluation will have a positive effect on the full employment wage-rate. (37') shows that the relative increase in w_1 is less than the relative rise in ε , at least as long as the balance of trade surplus is not too large.¹⁾

(38) shows that the sign of the income effect of a devaluation, is ambiguous. The income tends to rise due to the increase in w_1 (and thereby p_h). On the other hand, the devaluation increases the investment demand, and thus causes a reduction in period 1 sales and income. This last effect would, at least partly, be counteracted if we allow price- and income-expectations to be influenced by the devaluation. Presently, we will, however, keep strictly to the assumption that p_2 and y_2 are exogeneously given.

From (30) it is easily seen that the effects of an exogeneous shift in the expected future income, y_2 , are identical to the effects of a money expansion, as stated in (35) and (36). An increase in the expected future price level, yields

$$(39) \quad \left. \frac{dw_1}{dp_2} \right|_{FE} = \frac{c_2^h}{D}$$

$$(40) \quad \left. \frac{dy}{dp_2} \right|_{FE} = \frac{\partial y_1}{\partial w_1} \cdot \left. \frac{dw_1}{dp_2} \right|_{FE} .$$

1) From the homogeneity of $I(\cdot)$, it follows that

$-(I_{\varepsilon} \Gamma_2 \varepsilon \Gamma + I_{w_1} w_1) = I_{\gamma_2} \gamma_2 + I_{w_2} w_2 > 0$, so the only term that may be negative in the brackets, is $-c_y^h b$.

The sign of these depends on whether the commodities h and 2 are GS, or not. Equivalently, the effects of a change in the price expectations abroad, P_2 , depend on the gross substitutability between h and 2 abroad.

Turning, finally, to the producers' expectations, it is obvious from (30) that the effects of γ_2 , Γ_2 and w_2 deviate only in magnitude, not in sign, as long as all I_{γ_2} , $I_{\epsilon\Gamma_2}$ and I_{w_2} are non-negative. Studying e.g. a change in γ_2 , we get

$$(41) \quad \left. \frac{dw_1}{d\gamma_2} \right|_{FE} = \frac{1}{D} (1 - p_h^c y^h) I_{\gamma_2}$$

$$\left. \frac{dy}{d\gamma_2} \right|_{FE} = -p_h I_{\gamma_2} + \frac{\partial y_1}{\partial w_1} \left. \frac{dw_1}{d\gamma_2} \right|_{FE}$$

$$(42) \quad = \frac{p_h I_{\gamma_2}}{w_1 D} (c^h + p_h c_h^h + C^h + P_h C_h^h) .$$

Thus, a change in γ_2 (or in Γ_2 or w_2) implies an upward shift in the FE-locus, while the effect on income is ambiguous. If the demand for h-goods on the average is price-elastic, the total income will decrease as γ_2 increases; if the demand is inelastic, y will increase. (These effects are, of course, also subject to the rigidity of income expectations, as mentioned above.)

Having established these comparative-static properties of the FE-locus, we now turn to balance of payments questions.

Balance of Payments

The balance of payments (BoP) surplus, b , has already been used. Here we will define the concept, and trace out a locus in the (w_1, P_f) -space yielding $b = 0$, i.e. balanced trade (BT).

The BoP surplus, or rather the balance of trade surplus, may be defined as the value of exports less the value of imports, i.e.

$$(43) \quad b = \varepsilon P_h C^h(p_h, p_f, p_2, Y) - \varepsilon P_f c^f(p_h, p_f, p_2, y) .$$

It is often convenient to use an alternative expression for b . From the consumer's budget constraint, we have

$$p_h c^h + p_f c^f + p_2 c^2 = y = p_h c^h + \varepsilon P_h C^h + y_2 + \bar{m},$$

yielding

$$(44) \quad b = p_2 c^2(p_h, p_f, p_2, y) - y_2 - \bar{m} .$$

(43) and (44) are equivalent equations for b , and which one to be used in the study of BoP, will always be a question of convenience.

In tracing out our balance of trade (BT) locus, we will have to study two different situations, depending on whether there is unemployment or labour constraints in the economy. The reason why we have to study these regimes separately, is that both income- and price-determination differ in the different regimes.

Balance of Payments with labour constraints

As mentioned earlier we will deviate from the pricing rules in (22) in this regime. If p_h and εP_h are set in accordance with (22), there will be excess demand for h-goods, above what the firms are able to supply, and some kind of quantity rationing will be necessary. It would be impossible to satisfy both consumer's demand and investment demand at these prices, and a more or less arbitrary rationing scheme would have to be introduced. Further, once the monopolists experience labour constraints, (22) will no longer be an optimal pricing rule, due to the obvious fact that the prices may be increased without expecting a reduction in the quantities sold. We will assume that the firms realize this, and that prices are increased so much that quantity rationing is completely avoided. This amounts to

assuming that the firms use the wage rates along the FE-locus in their planning, instead of using the actual wage rate, which is below the FE-locus. This FE wage rate will be called \bar{w}_1 , indicating that it is almost equivalent to the shadow wage rate, defined in (16) above, the only difference being that the shadow wage was based on the firm's perceived demand curves, while the FE-wage rate stems from the actual demand conditions. \bar{w}_1 will, of course, be used both in pricing and investment decisions, thereby making the firm's behaviour independent of the actual wage rate. The only role left for w_1 , is to split the total income into labour income and profits.

An alternative approach could be to assume that the wage rate is downward rigid, but that it may possibly be increased. Then the lack of labour in this regime will probably result in a rise in w_1 until $w_1 = \bar{w}_1$. The analysis will be the same as with the assumptions above, but if w_1 rises whenever there is a labour constraint, this may yield serious problems because of the asymmetric responses in the economy to upward and downward shifts in the FE-locus. (This is, however, probably not an unrealistic feature in modern economies.)

Bearing in mind this possibility, we will return to the original assumptions, i.e. whenever $w_1 \leq \bar{w}_1$ the firms use \bar{w}_1 in their planning. The first thing to notice then, is that below the FE-locus the BoP is independent of the actual wage rate. Thus, the balanced trade (BT)-locus will be vertical in this regime. Using (44) and $p_h = k \cdot \bar{w}_1$, we get

$$(45) \quad \frac{db}{dP_f} = p_2^2 c_h^2 k \frac{d\bar{w}_1}{dP_f} + p_2^2 c_f^2 \epsilon + p_2^2 c_y^2 \frac{dy}{dP_f}$$

where $\frac{d\bar{w}_1}{dP_f}$ and $\frac{dy}{dP_f}$ are equal to the expressions that were calculated in tracing out the FE-locus. Both are non-negative, implying that gross substitutability is a sufficient condition to ensure that b increases as P_f increases. GS is still not a necessary condition, and using (33) and (34) we might have tried to find exact requirements for $db/dP_f > 0$. Instead of doing this,

we will, however, rather look at the value of (45) as we go to the extreme values of $d\bar{w}_1/dP_f$, remembering that

$$0 \leq \frac{d\bar{w}_1}{dP_f} \leq \frac{\bar{w}_1}{P_f} .$$

We get

$$\left(\frac{db}{dP_f}\right)_{\max} = \frac{p_2}{P_f} [\varepsilon P_f e_{2f} + p_h e_{2h} + c_y^2 b - p_h c_y^2 I_{w_1} w_1]$$

$$\left(\frac{db}{dP_f}\right)_{\min} = p_2 \varepsilon (e_{2f} - c_y^2 c^f)$$

where the maximum value is found by using $\frac{d\bar{w}_1}{dP_f} = \frac{\bar{w}_1}{P_f}$, and the minimum by using 0. Thus, if the FE-curve is steep, $db/dP_f > 0$ for certain, at least in the neighbourhood of balanced trade. If, on the other hand, FE is very flat, we have to require GS between the commodities 2 and f, to ensure that b responds positively to an increase in the foreign price level.

Always assuming sufficient substitutability, we get the following figure:

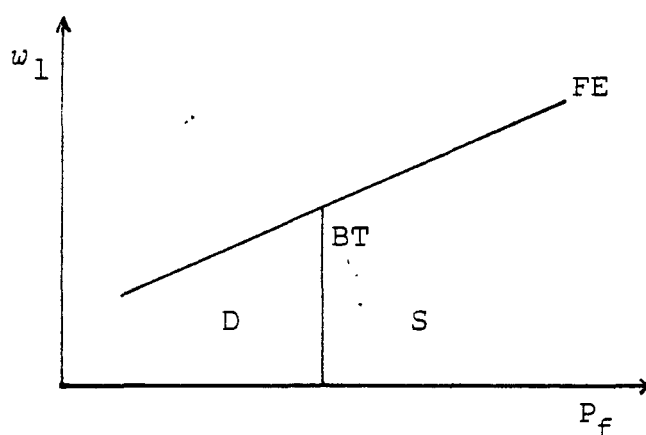


Fig. 2

D indicates a deficit ($b < 0$), while S is the surplus region ($b > 0$). Before tracing out BT above the FE-locus, we will establish comparative-static properties in the labour constraint regime.

Active monetary policy affects home goods prices and income, as in (35) and (36). The effects on b are best found by using (43):

$$\frac{db}{d\bar{m}} = (C^h + P_h C_h^h)k \frac{d\bar{w}_1}{d\bar{m}} - p_f c_f^h k \frac{d\bar{w}_1}{d\bar{m}} - p_f c_y^f \frac{dy}{d\bar{m}}.$$

Now, using $\frac{dy}{d\bar{m}} = 1 + \left(\frac{y_1}{\bar{w}_1} - p_h I_{w_1}\right) \frac{d\bar{w}_1}{d\bar{m}}$, the Slutsky equation (5) and

the homogeneity of e_f , we may write

$$\frac{db}{d\bar{m}} = [k(C^h + P_h C_h^h) + \frac{p_f}{\bar{w}_1} (p_f e_{ff} + p_2 e_{f2} - c_y^f \epsilon_{P_h C_h^h} + c_y^f p_h \bar{w}_1 I_{w_1})] \frac{d\bar{w}_1}{d\bar{m}} - p_f c_y^f.$$

Studying this expression in the neighbourhood of balanced trade, we may set $\epsilon_{P_h C_h^h} = p_f c_f^h$, yielding

$$(46) \quad \frac{db}{d\bar{m}} = k C^h \left(1 + \frac{P_h C_h^h}{C^h} + \frac{p_f}{c_f^h} c_f^h\right) \frac{d\bar{w}_1}{d\bar{m}} - p_f c_y^f + \left(\frac{p_f}{\bar{w}_1} p_2 e_{f2} + p_f c_y^f p_h I_{w_1}\right) \frac{d\bar{w}_1}{d\bar{m}}.$$

The first parenthesis is negative if the well-known Marshall-Lerner (ML) condition is satisfied. ML says that the sum of the price elasticities of imports to the two countries must be greater than unity, for a devaluation to be successful.¹⁾ Assuming ML to be satisfied we see that the only non-negative term in (46)

is $\frac{p_f}{\bar{w}_1} p_2 e_{f2} \frac{d\bar{w}_1}{d\bar{m}}$. In order to ensure $\frac{db}{d\bar{m}} < 0$, it would be nice to get rid of this term, or alternatively to make sure that it is dominated by the negative terms in (46). The best way of doing this, turns out to be by utilizing the separability in the utility function (1) more extensively.

Define $m = p_2 c^2 - y_2$, i.e. m is the excess demand for goods in period 2. Thus m is the amount of money carried over to the future, and from (44) it is seen that $b = m - \bar{m}$. The separability

1) As in the model discussed in Haaland (1982), there is a close relation between the effects of a devaluation and of monetary policy.

in (1) implies that for any exogeneously given m , we may write the period 1 demand functions as

$$(47) \quad \hat{c}_j = \hat{c}^j(p_h, p_f, y_1 + \bar{m} - m) \\ = \hat{c}^j(p_h, p_f, y_1^{-b}), \quad j = h, f.$$

\hat{c}^j is homogeneous of degree 0 in all arguments. If m is optimally chosen, \hat{c}^h and \hat{c}^f are equal to the values of the demand-functions used throughout this paper. Thus, supposing that m in (47) is optimal, we may write (43) as

$$b = \varepsilon P_h C^h(p_h, p_f, p_2, Y) - p_f \hat{c}^f(p_h, p_f, y_1^{-b}).$$

In the neighbourhood of $b = 0$, this yields

$$(48) \quad \frac{db}{d\bar{m}} = -\frac{1}{1 - p_f \hat{c}_y^f} \left[k C^h \left(1 + \frac{p_h C^h}{C^h} + \frac{p_f \hat{c}_f^f}{\hat{c}_f^f} \right) + p_f \hat{c}_y^f p_h I_{w_1} \right] \frac{d\bar{w}_1}{d\bar{m}},$$

ensuring that the Marshall-Lerner condition is sufficient for $db/d\bar{m} < 0$. ML is not a necessary condition, due to the additional income effect obtained through the investment function. However, as before this last effect is somewhat arbitrary, since a change in I affects the present income, but has no effect on the expectations.

Before turning to the BoP-effects of a devaluation, it is worth pointing out that a change in y_2 , the exogeneously given income expectation, yields exactly the same results as a monetary expansion. Not only the BoP effects, but also the employment- and price-effects are identical whether they stem from a monetary expansion or from an increase in the expected level of future income.

Like in the analysis of a monetary expansion, we must use the \hat{c}^f -function to get clear-cut results of a devaluation. Putting in $p_f = \varepsilon P_f$, we have

$$b = \varepsilon P_h C^h(P_h, P_f, P_2, Y) - \varepsilon P_f \hat{c}^f(p_h, \varepsilon P_f, y_1^{-b})$$

$$\frac{db}{d\varepsilon}(1 - p_f \hat{c}_y^f) = \frac{b}{\varepsilon} + \varepsilon (C^h + P_h C_h^h) \frac{dP_h}{d\varepsilon} - \varepsilon P_f (\hat{c}_h^f \frac{dp_h}{d\varepsilon} + \hat{c}_y^f \frac{dy_1}{d\varepsilon}).$$

Using (38), $\frac{dp_h}{d\varepsilon} = k \frac{d\bar{w}_1}{d\varepsilon}$, $\frac{dP_h}{d\varepsilon} = \frac{k}{\varepsilon} (\frac{d\bar{w}_1}{d\varepsilon} - \frac{\bar{w}_1}{\varepsilon})$, and the homogeneity of \hat{c}^f , we finally get

$$(49) \quad \frac{db}{d\varepsilon}(1 - p_f \hat{c}_y^f) = k C^h (1 + \frac{P_h}{C^h} C_h^h + \frac{p_f}{\hat{c}_f^f} \hat{c}_f^f) (\frac{d\bar{w}_1}{d\varepsilon} - \frac{\bar{w}_1}{\varepsilon}) \\ + p_f \hat{c}_y^f (p_h^I \varepsilon \Gamma_2 \Gamma_2 + p_h^I w_1 \frac{d\bar{w}_1}{d\varepsilon}) + \frac{b}{\varepsilon} (1 - p_f \hat{c}_y^f \frac{\varepsilon}{\bar{w}_1} \frac{d\bar{w}_1}{d\varepsilon}).$$

In dividing through the first parenthesis I have used the balanced trade assumption, $\varepsilon P_h C^h = p_f \hat{c}^f$. This term could more generally have been written as the weighted sum of the price elasticities. With this modification, (49) will apply generally, as long as the economy is below the FE-locus.

From (37') we have $\frac{d\bar{w}_1}{d\varepsilon} - \frac{\bar{w}_1}{\varepsilon} < 0$, implying that ML is necessary and sufficient to ensure that the first term in (49) is positive. The second term in (49) appears due to the income effects of the investment responses to the devaluation. We don't know the sign of this expression, but these effects are subject to the same qualifications as made earlier with regard to income and investments, i.e. the rigidity of the expectations. The last term in (49) appears whenever there is not balanced trade initially. As

$$p_f \hat{c}_y^f \frac{\varepsilon}{\bar{w}_1} \frac{d\bar{w}_1}{d\varepsilon} < p_f \hat{c}_y^f < 1,$$

this term will always have the same sign as b .

Thus, neglecting the income effects of the investment behaviour, we have shown that the Marshall-Lerner condition is necessary and sufficient to ensure $db/d\varepsilon > 0$ and $db/d\bar{m} < 0$, starting from

a position of balanced trade. In the case of monetary policy, the I-adjustment pulls in the same direction as the ML, while when it comes to a devaluation, the effects through investments, may have either sign.

The last things to consider in this regime, are possible effects of shifts in the exogeneous expectations p_2 , γ_2 , Γ_2 and w_2 . The producer's expectations work through the investment function, and we know that, except for magnitudes, the effects of γ_2 , Γ_2 and w_2 are similar. Price- and income-effects are as in (41) and (42), and using (44), we get

$$\begin{aligned} \frac{db}{d\gamma_2} &= p_2 c_h^2 k \frac{d\bar{w}_1}{d\gamma_2} + p_2 c_y^2 \frac{dy}{d\gamma_2} \\ (50) \quad &= [p_2 c_h^2 k + \frac{p_2 c_y^2}{1 - p_h c_y^h} (c^h + p_h c_h^h + C^h + P_h C_h^h) k] \frac{d\bar{w}_1}{d\gamma_2} . \end{aligned}$$

The sign of this expression depends on the degree of elasticity in the demand for h-goods, and also on the substitutability between commodities 2 and h. Thus, we cannot give any general rule as to what happens to the BoP as the investment demand increases due to shifts in γ_2 , Γ_2 or possibly w_2 . (The w_2 -effect disappears if the firm expects labour constraints in the future.) We will, however, return to this question in the next section, because there is a close relation between the expression in (50) and some crucial conditions in that section.

Finally, we will consider a shift in the expected future price-level. Intuitively one would think that the BoP effect of such a shift, is a simple question of gross substitutability. However, due to the period 1 price- and income-effects of an increase in p_2 , the problem turns out to be a bit more tricky. Using (43), (39) and (40) we may write

$$\frac{db}{dp_2} = k(C^h + P_h C_h^h) \frac{c_2^h}{D} - p_f [(c_h^f + c_y^f \frac{\partial y_1}{\partial w_1}) \frac{c_2^h}{D} + c_2^f] .$$

GS between all commodities at home plus elastic demand for h-goods abroad, ensures $db/dp_2 < 0$. It seems to be difficult to find weaker conditions ensuring this result, at least if we require such conditions to be economically interpretable.

Balance of Payments and unemployment

In this regime we must pay attention to the possibilities of changes in the level of employment, and thereby changes in the real income. On the other hand, prices will now be given by (22), i.e. as long as w_1 and P_f are constants, there will be no price-changes. Our aim is still to trace out the locus yielding $b = 0$, and this will no longer be independent of w_1 .

Income effects may be of importance. As the producers are assumed to meet any demand at the going prices, the demand for h-commodities will be decisive for y_1 in this regime. We have

$$(51) \quad y_1 = p_h c^h(p_h, p_f, p_2, y_1 + y_2 + \bar{m}) + \varepsilon P_h C^h(p_h, p_f, p_2, Y).$$

p_h , εP_h , p_f and Y are still given by

$$(22) \quad p_h = \varepsilon P_h = \frac{w_1}{af'(\ell_1)} = k \cdot w_1$$

$$(27) \quad p_f = \varepsilon P_f$$

$$(29) \quad Y = P_f \cdot C_f + Y_2 + \bar{M}.$$

From (51), income effects will obviously appear as multiplier expressions.

$$\begin{aligned} \frac{dy_1}{dP_f} &= \frac{1}{1 - p_h c_y^h} (p_h c_{f\varepsilon}^h + \varepsilon P_h C_f^h + \varepsilon P_h C_Y^h \cdot C^f) \\ &= \frac{1}{1 - p_h c_y^h} (p_h c_{f\varepsilon}^h + \varepsilon P_h E_{hf}) . \end{aligned}$$

Thus GS between h and f at home ensures that y_1 rises as P_f increases.

$$\frac{dy_1}{d\bar{w}_1} = \frac{k}{1 - p_h c_y^h} (e^h + p_h c_h^h + C^h + p_h C_h^h).$$

This is negative if a weighted sum of the price elasticities of the demand for h-goods at home and abroad, is greater than unity. Otherwise, it is positive. But do we know anything about these elasticities? We know, of course, that along the perceived demand curves, the elasticities must be greater than 1, if the monopolist behaves optimally. $e^h(\cdot)$ and $C^h(\cdot)$ will, however, typically be less elastic than the perceived curves, so reference to optimal monopolistic behaviour does not help very much.

A point that may help whenever it comes to price elasticities, is the following: If we assume all commodities to be GS, then the own-price elasticity is greater than 1. Using the homogeneity of e.g. the e_h function, this is easily seen. We have

$$\begin{aligned} c_h^f \text{ and } c_h^2 &> 0 \quad (\text{by assuming GS}) \\ \Rightarrow p_f c_h^f + p_2 c_h^2 &> 0 \\ \Rightarrow p_f (e_{fh} - c_y^f c^h) + p_2 (e_{2h} - c_y^2 c^h) &> 0 \quad (\text{Slutsky-eq.}) \\ \Rightarrow p_f e_{fh} + p_2 e_{2h} - (p_f c_y^f + p_2 c_y^2) c^h &> 0 \\ \Rightarrow p_f e_{fh} + p_2 e_{2h} - (1 - p_h c_y^h) c^h &> 0 \quad (\text{by: } p_h c_y^h + p_f c_y^f + p_2 c_y^2 = 1) \\ \Rightarrow -p_h e_{hh} + p_h c_y^h c^h - c^h &> 0 \quad (\text{homogeneity of } e_h) \\ \Rightarrow p_h c_h^h + c^h &< 0, \end{aligned}$$

which is what we wanted to show.

Thus, if we assume GS between all commodities at home and abroad, this is enough to ensure that all our conditions containing

elasticities, are fulfilled. The elasticity-conditions are, however, weaker than a general assumption of gross substitutability, and that is why we have been stating elasticity-conditions whenever that is sufficient.

Now turning to BoP questions, we have

$$(52) \quad b = p_2 c^2 (k w_1, \epsilon P_f, p_2, y_1 + y_2 + \bar{m}) - y_2 - \bar{m}.$$

Varying w_1 and P_f , we get

$$\begin{aligned} db &= (p_2 c_h^2 k + p_2 c_y^2 \frac{dy_1}{dw_1}) dw_1 + (p_2 c_f^2 \epsilon + p_2 c_y^2 \frac{dy_1}{dP_f}) dP_f \\ &\equiv b_{w_1} dw_1 + b_{P_f} dP_f. \end{aligned}$$

Along the BT-locus, we thus have

$$(53) \quad \left. \frac{dw_1}{dP_f} \right|_{BT} = - \frac{b_{P_f}}{b_{w_1}}.$$

The sign of (53) is ambiguous. GS yields $b_{P_f} > 0$, but it is not sufficient to decide the sign of b_{w_1} . Using the Slutsky equation and $1 - p_h c_y^h = p_f c_y^f + p_2 c_y^2$, we may rewrite b_{w_1} as

$$b_{w_1} = k [p_2 e_{2h} + \frac{p_2 c_y^2}{p_f c_y^f + p_2 c_y^2} (p_h e_{hh} + C^h + P_h E_{hh})].$$

The more elastic the demand for h-goods is, the greater is the possibility of $b_{w_1} < 0$. Further, the importance of the income effect is greater, the larger $p_2 c_y^2$ is, and the smaller $p_f c_y^f$ is. This is, of course, not very surprising; if the income reduction (following the rise in w_1) has a great impact on planned future consumption, it also reduces planned excess demand in the future,

i.e. *b*. If, on the other hand, the income reduction mainly influences c^f , this tends to improve the trade balance.

From (53) it is obvious that $b_{w_1} > 0$ yields a negatively sloped BT-locus in the unemployment regime (figure 3.a), while $b_{w_1} < 0$ yields a rising BT-locus (figure 3.b). In figure 3.b the slope of BT has to be greater than the slope of FE, because along FE we have $dy_1/dw_1 > 0$, while a necessary condition for a positively sloped BT-locus, is $dy_1/dw_1 < 0$.

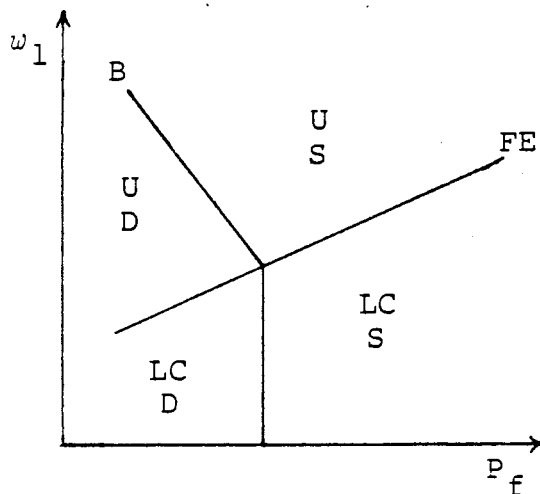


Fig. 3.a

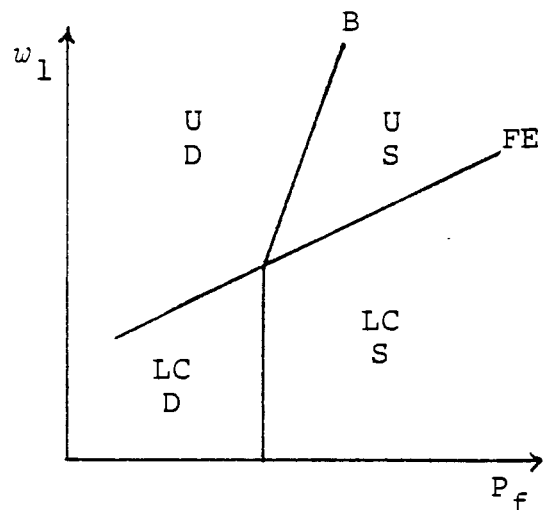


Fig. 3.b

Monetary policy has no effects on prices in this regime. BoP is affected through the income effects. Using (51) and (52) we get

$$\begin{aligned} \frac{dy_1}{d\bar{m}} &= \frac{p_h c_y^h}{1 - p_h c_y^h} \\ \frac{db}{d\bar{m}} &= p_2 c_y^2 \left(\frac{dy_1}{d\bar{m}} + 1 \right) - 1 \\ &= \frac{p_2 c_y^2 + p_h c_y^h - 1}{1 - p_h c_y^h} \end{aligned}$$

i.e. a monetary expansion always yields a deterioration in b . The BT-locus shifts rightwards, thereby enlarging the deficit-region (see figure 4.a and b).

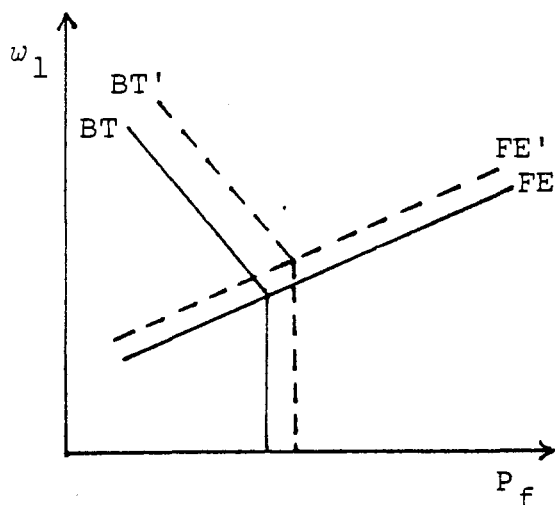


Fig. 4.a

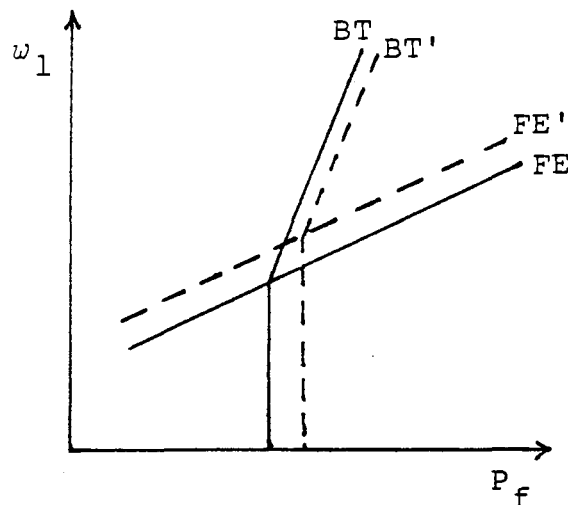


Fig. 4.b

In figure 4 it is assumed that the Marshall-Lerner condition is satisfied in the labour constraint-regime, and the figures show the total effects of a monetary expansion. And, as mentioned above, an increase in expected future income, y_2 , yields exactly the same results. Thus, the shifts in fig. 4 may as well be caused by a change in the expected level of future income.

A devaluation affects p_f , P_h , y_1 and b , and we get

$$\frac{dy_1}{d\varepsilon} = \frac{1}{1 - p_h c_y^h} (p_h c_f^h p_f - p_h c_h^h \frac{p_h}{\varepsilon^2})$$

$$\frac{db}{d\varepsilon} = p_2 c_f^2 p_f + p_2 c_y^2 \frac{dy_1}{d\varepsilon} .$$

GS is a sufficient, but not a necessary, condition to ensure $dy_1/d\varepsilon > 0$ and $db/d\varepsilon > 0$. Using the Slutsky-equation, we could get alternative, and weaker, conditions for $db/d\varepsilon > 0$, but none of these seem to yield any new insight. Assuming the necessary conditions to be fulfilled, the total effects of a devaluation are as in figure 5.

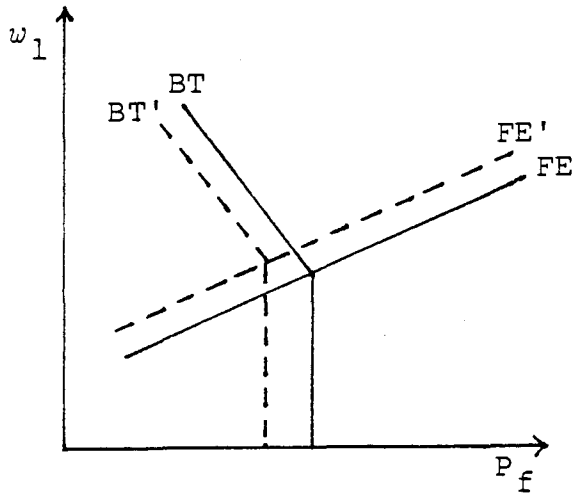


Fig. 5.a

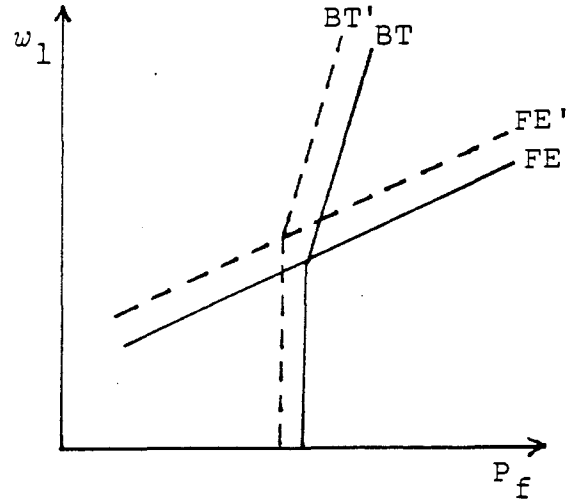


Fig. 5.b

By now it should be obvious that the investment behaviour is of no importance with regard to the income- and BoP-conditions in this regime. This is not very surprising, since there are no capacity constraints, and, by assumption, the firm supplies whichever quantity demanded. The investment demand still affects the employment situation, and it may be important in that respect, but as prices and income are independent of the level of employment (due to the constant marginal cost-assumption), there is no link between the I-function and the BoP.

In the labour constraint regime, it was shown that b was influenced by changes in I , but the sign of the effect was ambiguous. Now, comparing our condition for the slope of the BT-locus, i.e. $b_{w_1} \geq 0$, and equation (50), we see that they are identical. Thus, whenever the BT-locus is decreasing above FE, an increase in I improves the BoP at or below FE, and vice versa (see fig. 6).

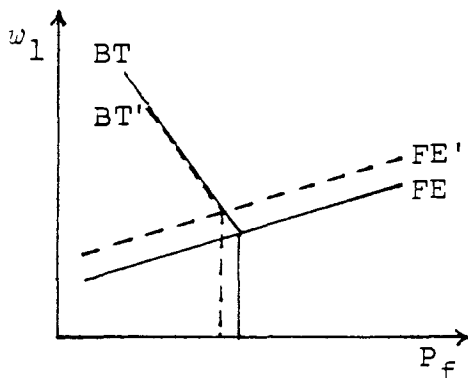


Fig. 6.a

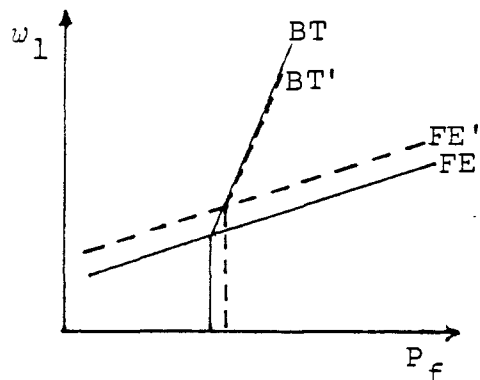


Fig. 6.b

Finally, we will study the effects of an exogeneous increase in the expected future price level. Above FE, the present prices are not influenced by a rise in p_2 , and using (51) and (43), we get

$$\begin{aligned} \frac{dy_1}{dp_2} &= \frac{p_h^e h}{1 - p_h^e y} \\ \frac{db}{dp_2} &= -p_f^e f - p_f^e y \frac{dy_1}{dp_2} \\ &= -p_f^e f - p_f^e y \frac{p_h^e h}{1 - p_h^e y} . \end{aligned}$$

GS (on the average) between f and 2, and between h and 2 is necessary and sufficient to get $db/dp_2 < 0$. Thus the condition yielding $db/dp_2 < 0$ is somewhat weaker in this regime than in the LC-regime (where it had to be assumed GS between all commodities at home and abroad).

Summary: exogeneous expectations

Table 1 sums up our main results. Superscript FE and U indicate, respectively, the endogeneous variables at (or below) the FE-locus, and in the unemployment regime. Further, observe that

- all FE expressions are contingent upon the stability-condition, $D > 0$, being fulfilled.
- GS means that some kind of gross substitutability is either sufficient or necessary to obtain the indicated effect.
- ML indicate that the Marshall-Lerner condition is sufficient to ensure the effect.

Exo- geneous	P_f	ε	\bar{m}	w_1	y_2	p_2	γ_2	Γ_2	$w_2^{1)}$
w_1^{FE}	+ GS	+ GS	+		+	+ GS	+	+	+
y_1^{FE}	+ GS	?	+	+	+	+ GS	+ ₋₂₎	+ ₋₂₎	+ ₋₂₎
b^{FE}	+ GS	+ ML	- ML	0	- ML	- GS	+ ₋₃₎	+ ₋₃₎	+ ₋₃₎
y_1^U	+ GS	+ GS	+	+ ₋₂₎	+	+ GS	0	0	0
b^U	+ GS	+ GS	-	+ ₋₃₎	-	- GS	0	0	0

Table 1

1) All w_2 -effects disappear if the firm expects labour constraints in the future, i.e. if $\bar{I}(\cdot)$ is used.

2) The condition is $e^h + p_h e_h^h + C^h + P_h C_h^h \geq 0$.

3) The condition is

$$b_{w_1} = k \left[p_2 e_{2h} + \frac{p_2 e_y^2}{p_2 e_y + p_f e_y} \bar{f} (p_h e_{hh} + C^h + P_h E_{hh}) \right] \geq 0$$

i.e. the BT-locus being decreasing or increasing above the FE-locus.

ENDOGENEOUS EXPECTATIONS

In this section we will briefly sketch some possible effects of allowing the expectations to be decided endogeneously in our model, i.e. e.g. letting expected future price-level be a function of the present development in prices, etc. There are, of course, very many ways in which the expected figures γ_2 , Γ_2 , w_2 , p_2 and y_2 may be related to the present results, and we will not try to exhaust all possibilities. We will rather trace out some general features, and give some examples.

Firstly, it should be noticed that for one kind of endogeneous expectations, the system in table 1 can be applied directly, and that is whenever the expectations only depend on right hand side (RHS)-variables in (30), i.e. on other exogeneous variables. If e.g. the expected future market conditions depend on the price on foreign goods today, we may write

$$\gamma_2 = \gamma_2(P_f).$$

Thus, whenever P_f changes, there will be a change in γ_2 as well (and probably also in Γ_2 , but to simplify, that effect is neglected). However, as long as γ_2 is independent of the LHS-variables in (30), the total effect of a change in P_f may be found simply by adding the direct and the indirect effects on the RHS. Using the same notation as in the previous section, we may now write the slope of the FE-locus as:

$$\left. \frac{dw_1}{dP_f} \right|_{\gamma_2(P_f)} = \left. \frac{dw_1}{dP_f} \right|_{FE} + \left. \frac{dw_1}{d\gamma_2} \right|_{FE} \cdot \frac{d\gamma_2}{dP_f}$$

where the terms $\left. \frac{dw_1}{dP_f} \right|_{FE}$ and $\left. \frac{dw_1}{d\gamma_2} \right|_{FE}$ are identical to the expressions calculated in (32) and (41), respectively. Thus, if γ_2 is an increasing function of P_f , the FE-locus will be steeper than the one given in (32). Similarly, we may find BoP effects simply by adding the expressions calculated in the above section.

This procedure applies as long as the expected figures do not depend on the values of the endogeneously decided period 1 variables, i.e. w_1^{FE} , y_1 and b . If, for instance, one believes that a devaluation, or a monetary expansion, influences the future price- or income-level, this may obviously be important for the economic adjustments made today. If one knows the functional relationship between e.g. ε and p_2 or y_2 , it is, however, no problem to take these new features into consideration: one simply adds the necessary expectation-terms to the expressions calculated above.

This fact being established, there remain, in principle, only two troublesome questions. The one concerns what will happen if the expected figures depend on the endogeneously set variables as well, and the other may run like this: How do, in fact, the expectations adjust to changing economic conditions? This last question could deserve a paper on its own, and here we will only briefly discuss some possibilities. Thereafter, we will return to the first question.

The (representative) firm has expectations concerning future market conditions (γ_2 and Γ_2), and future costs (w_2 , or with expected labour constraints \bar{w}_2). The possibility of letting γ_2 and Γ_2 depend on P_f is already mentioned, and nothing more will be said about expected market conditions. The wage rate, w_2 , does not yield any effect on the present economic situation if the firm expects to meet labour constraints in the future, i.e. if $w_2 < \bar{w}_2$. Thus, the following discussion only applies when there are no expected constraints. In this case, a first thing to point out, is that expected w_2 probably depends on the present wage rate, w_1 . However, by assumption, w_1 is exogeneously given, so the link between w_2 and w_1 does not yield any interesting results. If, on the other hand, we allow for increases in w_1 while still retaining the assumption of downward rigidity (a possibility that has been mentioned), then the relationship between w_2 and w_1 may be both important and interesting. The relationship may for example be like

$$dw_2 \geq dw_1 = \begin{cases} dw_1^{FE} & \text{when } dw_1^{FE} > 0 \\ 0 & \text{when } dw_1^{FE} \leq 0, \end{cases}$$

yielding asymmetric responses to upward and downward shifts in the economy.

It may be worth pointing out that the same kind of link between w_2 and w_1^{FE} may appear as the result of real-wage rigidity in the long run. If e.g. the system is such that wages are adjusted once each period to compensate for past price-level increases, while at the same time nobody accepts reductions in the nominal wage rate, then the result is that w_2 increases whenever p_h or p_f increases. Such a system will obviously influence the behaviour of the firm both in the short run and in the long run.

Turning now to the (representative) consumer's expectations, it seems natural to let the expected price-level be a function of present prices, i.e.

$$p_2 = p_2(p_h, p_f).$$

As to expected income, this will probably be influenced by a large amount of factors. We know that total income equals profits plus labour income. One possible expression for y_2 may then be found by letting the consumer's expectations coincide with those of the producer. That yields

$$\begin{aligned} y_2 &= \pi^2(\gamma_2, \varepsilon\Gamma_2, w_2, I) + w_2 \ell_2 \\ &= \pi^2(\gamma_2, \varepsilon\Gamma_2, w_2, I) - w_2 \pi^2_{w_2}(\gamma_2, \varepsilon\Gamma_2, w_2, I) \\ (54) \quad &= y^2_{+ + - -}(\gamma_2, \varepsilon\Gamma_2, w_1, w_2), \end{aligned}$$

using the optimal I . Following Stiglitz and Neary (1983) this solution may be called rational expectations.

It is not easy to feel quite content with the income expectation in (54). For one thing, the negative effects of w_1 and w_2 on y_2 do not seem to be very realistic. But more important is the fact that if the consumer really expects income to be as in (54), there is no reason for using fixed or rigid wages in our model. Why should anybody want to keep w_2 at a high level, if nobody expects to get higher income from such a policy? Writing, instead, the expected income as

$$y_2 = y^2(\dots, w_1, w_2)$$

+ +

may thus be one possible argument for the rigidity in wages.¹⁾

This is as far as we will go in specifying the expectations. Allowing, in general, w_2 , p_2 and y_2 to depend on w_1^{FE} , we will now study possible effects of such dependence on the present temporary equilibrium situations. The left hand side matrix of the full employment-system (i.e. the inverse of the first RHS matrix in (30)) may now be written

$$(55) \quad \begin{bmatrix} kc_h^h + \frac{k}{\epsilon} C_h^h + I_{w_1} + I_{w_2} \frac{\partial w_2}{\partial w_1} + e_2^h \frac{\partial p_2}{\partial w_1} \\ \frac{y_1}{w_1} - p_h I_{w_1} - p_h I_{w_2} \frac{\partial w_2}{\partial w_1} + \frac{\partial y_2}{\partial w_1} \end{bmatrix} \begin{bmatrix} e_y^h \\ -1 \end{bmatrix} \begin{bmatrix} dw_1 \\ dy \end{bmatrix}$$

The right hand side will be equivalent to the last matrix in (30), the only difference being that expected figures may depend on the other exogeneous variables.

The expectation terms in (55) obviously influence the determinant, D . If $\partial w_2 / \partial w_1$, $\partial p_2 / \partial w_1$, and $\partial y_2 / \partial w_1 > 0$, all these tend to reduce D . As $D > 0$ is a stability condition, expectations like these enlarge the possibility of an unstable solution. Without knowing the magnitudes of the changes in the expectations, we cannot find

1) My intention is not to give a good explanation of rigid wages, I am only trying to avoid the obvious inconsistency following the use of (54). For a discussion of reasons for rigidity, see Hahn (1979).

any exact conditions ensuring $D > 0$. However, once we have a hypothesis concerning these effects, it should be no problem calculating D .

If we assume the stability condition to be satisfied, the expectations nevertheless yield a reduction in D compared to the one we used in calculating the comparative-static properties of the model with exogeneously given expectations. This tends to enlarge all w_1^{FE} responses to exogeneous shifts, while the effects on y_1^{FE} and b^{FE} seem to be ambiguous, and should be calculated separately for different shifts and for different expectation-structures. In the unemployment-regime the endogeneity of the expectations may have an influence on the properties of the BT-locus. These new effects are, however, easily found: One simply adds together all relevant terms.

CONCLUDING REMARKS

In this paper it has been shown that introducing monopolistic competition in an otherwise simple model of a small, open economy, may yield interesting results. We did, for instance, get real economic effects of monetary and exchange rate policies in our model.

A dominating feature in the analysis has been that some kind of gross substitutability is often helpful or necessary in obtaining clear-cut results. Without GS the probability of experiencing unstable solutions increases, and even if the stability condition still is fulfilled, we may get some strange comparative-static effects.

The importance of the expectations may briefly be summed up as follows: The firm's expectations, working through the investment function, tend to smooth out the effects of shifts in other exogeneously given variables. (This is easily seen by comparing our results with those that might have appeared if we always

required $I = 0$.) The consumer's expectations may, on the other hand, very well work in the opposite direction. These probably tend to reduce the determinant D , thereby reducing the probability of stable solutions and enlarging all full-employment shifts. This does, of course, depend on the way we specify expectations, and there is a lot more to be done in this area.

In the introduction, the model of Neary and Stiglitz (1983) was mentioned. Their results are quite different from those obtained in this paper. This should, however, not be very surprising. One important difference between my model and that of Neary and Stiglitz, is that I allow some price-flexibility instead of introducing quantity-rationing. As many of their results stem from assumptions of different rationing-regimes both presently and in the expected future, it should not come as a surprise that lack of equilibria with rationing yields smoother results. On the other hand, it is not impossible that a more thorough study of different specifications of endogeneity in the expectations in our model, may yield results that are more rare and unexpected than those we have worked out in this paper. Within the framework of the model we have used, there is obviously room for additional analyses.

REFERENCES

- Dixit, A. and Norman, V. (1980) Theory of International Trade. Cambridge University Press, Cambridge.
- Haaland, J.I. (1982) Temporær likevekt og monopolistisk konkurranse i en liten åpen økonomi. Unpublished manuscript, NHH, Bergen.
- Hahn, F. (1979) Notes on Non-Walrasian Analysis. Economic Theory Discussion Paper no.26, University of Cambridge.
- Neary, J.P. and Stiglitz, J.E. (1983) Towards a Reconstruction of Keynesian Economics: Expectations and Constrained Equilibria. Quarterly Journal of Economics, Supplement.

STATIONARY EQUILIBRIUM IN A SMALL, OPEN ECONOMY
WITH MONOPOLISTIC COMPETITION

STATIONARY EQUILIBRIUM IN A SMALL, OPEN ECONOMY
WITH MONOPOLISTIC COMPETITION

1. INTRODUCTION

In studies of open economies the analysis is often simplified by assuming that the economy in question is small. This assumption has two distinct implications: In an aggregate sense, it means that whatever happens in this economy it is of no importance for the macroeconomic situation in the rest of the world. In a disaggregate sense it implies that domestic exporters and importers are 'price takers' on the world markets; they face perfectly elastic demand and supply curves, and they may thus trade as much as they please at the going prices.¹⁾ For such an economy, the only important international link goes through the given price levels; all relevant information about supply and demand conditions is contained in these prices.

The 'price taker'-implication does, however, not follow from smallness alone; in addition it must be assumed that the traded commodities are homogeneous. Because if the products are heterogeneous, there is no reason why a supplier from a small country necessarily should be less important than a supplier from a large country in the market for a particular product. The small economy will typically be represented only in a subset of the total number of commodity-markets in the world, but it may very well have dominating positions in the few markets where it does take part. This means that the producers cannot view the world price as a parameter any more; in order to behave optimally they have to realize that world market prices may depend on their own actions.

1) Such a "small country" assumption is applied in many different circumstances. It is common in the literature on the monetary approach to the balance of payments (see e.g. the Introductory Essay in Frenkel and Johnson (1976) for a discussion). It is also used in several articles on temporary equilibrium in open economies, e.g. Dixit (1978), Dixit and Norman (1980) and Neary (1980).

Considerations like these form the motivation for the analysis in this paper. I will develop a model of an economy which is small in the aggregate sense mentioned above, but due to heterogeneity of products, it cannot take prices as given. To be specific, we shall assume that each and every producer produces his own variety which in one way or another is different from all other varieties; then the market situation will typically be one of monopolistic competition, and we shall see how this assumption influences the equilibrium situation in an otherwise simple model of a small open economy.

In Essay no. 2 and in Haaland (1982) I studied temporary equilibria in such a setting. Presently I will look at long run stationary equilibrium situations in a similar, but not identical model. It is a one-sector economy; all domestic producers are in the same industry. Their products are imperfect substitutes, and they are also imperfect substitutes to foreign produced goods. To assume that all firms are in the monopolistically competitive industry, is of course at least as extreme as assuming that they are all price-takers; however, by doing so it is possible to highlight the special results that the assumption yields. It is also easier to spell out the microeconomic foundation of the model, when we restrict our attention to only one sector. In principle it is no problem to add a perfectly competitive industry in the model, but presently I will stick to the one-sector version, to keep the analysis as simple as possible.

In section 2 I will develop the microeconomic foundation of the model in some detail. The resulting optimum behaviour rules will in section 3 be brought together to form a system of equations specifying long run equilibrium. Then in section 4 this system will be applied in the analysis of equilibrium properties in a regime with fixed exchange rate. In particular, we will focus on the interrelationship between the small economy and the rest of the world. Finally in section 5 it will be shown that the same kind of results can be established in a floating exchange rate regime. However, before we turn

to the details of the model, we will briefly discuss some basic assumptions, and see why the model apparently becomes quite different from the one used in Essay no. 2, even though the underlying structure is the same.

In Essay no. 2 the focus was on temporary equilibria in a situation, labelled short-run, with the following characteristics: no entry to or exit from the industry, rigid wage rate, no equilibrating forces working on the external balance, and, in most of the analysis, exogenously given expectations. None of these assumptions can be justified when we move towards the long run.

Presently I am going to analyse stationary equilibria in an economy with rational expectations, free entry to (or exit from) the monopolistically competitive industry, flexible wage rate, and balanced trade.

Restricting the analysis to the study of stationary solutions must be considered a simplifying assumption. However, when looking at long-run equilibria such an assumption can probably be justified. Without it, alternative equilibrium situations might exist, but the stationary one will nevertheless be an important case. Some alternatives would probably be straightforward generalizations of the stationary solution, e.g. equilibrium paths with constant, balanced growth in all variables. On the other hand, there may possibly also exist rational expectation equilibria with unbalanced growth in the variables, e.g. with constant money stock and inflation, as in Hahn (1982); such possibilities are beyond the scope of this paper.

The modelling of rational expectations (or, rather, perfect foresight, since there is no uncertainty) becomes very easy when we study stationary situations. This does not, however, mean that the assumption regarding expectation formation is unimportant. When it comes to stability properties, for instance, expectations may be decisive for the outcome of the analysis.

The free entry assumption is the main reason why it is necessary to alter the model, compared to the one in Essay no. 2. The equilibrium number of firms will be determined so that all firms in business earn non-negative profits, while potential entrants face negative profit possibilities. To make such a criterion operational one has to know how demand for existing products reacts when new varieties are introduced. Such information cannot be obtained from general specifications of the consumers' optimization problems; it is necessary to choose a specific utility representation to get interpretable results.²⁾ But then, of course, the results from the analysis will have to be considered as one possible outcome, based on a specific utility function, rather than as general results.

The wage-rate flexibility means that we study full employment equilibria. When it comes to the stability analysis, however, a situation with rigidity in the wage-rate adjustment will be considered, and this turns out to have important implications for the stability properties of the model.

Finally, the fact that we always require equilibrium in the money market (which is equivalent to the balanced trade requirement) creates some problems for the modelling. The combination of stationarity and perfect foresight implies that aggregate income and consumption remain constant over time. But then there will be no aggregate net saving, and it is important to make sure that there nevertheless is positive demand for money in the model. Problems may arise in a model with one representative consumer and no uncertainty, and in which the only purpose of holding money is as a store of value (as in Essay no. 2). To avoid such problems the present model has two consumers in a simple overlapping generation

2) The necessity of using specific functions seems to be generally accepted; see e.g. Dixit and Stiglitz (1977), Spence (1976) and Dixit and Norman (1980).

framework, and positive demand for money is ensured by assuming that total domestic income is unevenly distributed between the generations. Each consumer earns the larger part of his total income when he is young, and in order to smooth his lifetime consumption profile, it is necessary to transfer purchasing power to the future. But this can only be achieved by holding money, and there will thus be positive gross savings in the model.

2. THE MODEL

The economy is small in the sense that whatever happens in our economy it has no effects on macroeconomic conditions abroad. Foreign income, employment etc. may be considered as exogenously given. Nevertheless, due to the assumed heterogeneity, the firms do not face given world market prices for their products. Each firm produces its own variety, which can be distinguished from all other varieties. There may be more or less close substitutes, but there are no perfect substitutes, and each firm perceives a downward sloping demand curve for its product. The number of firms (and thus the number of different varieties) is large, and in assessing its optimum price, each firm assumes that, due to its smallness, its decision will have no effect on the prices or quantities of other products. The perceived demand function is thus equivalent to the dd-curve in Chamberlinian terminology.

To stick to that terminology we need something similar to the DD-curve to be able to analyse general equilibrium situations. The DD-curve shows the demand effects for each product if all firms in the industry adjust their prices simultaneously. In the present model the monopolistically competitive industry comprises all firms in the economy. Then there will obviously be substantial income effects accompanying such a price change, and these effects must be taken into consideration in the analysis. I will thus use a generalized DD-curve, i.e. a DD-function which includes all general equilibrium income effects.

2.1 DEMAND

All domestically produced commodities are traded internationally, and total demand for each product equals the sum of domestic demand and demand from abroad. Each of these components consists of demand from two generations. I will discuss in some detail the optimization problem of the young consumer at home; the remaining components of total demand are easily established as simple modifications of the young's demand functions.

The young consumer has a two-period lifetime, and demand for goods now and in the future is determined in such a way as to maximize total lifetime utility, subject only to the lifetime budget constraint. Intertemporal transfers are achieved by holding money, and in principle these transfers may be both positive and negative. However, in the sequel appropriate assumptions will be made to ensure positive savings.

As mentioned, it is necessary to choose a specific utility function. The one that will be applied here has constant elasticity of substitution (CES) between goods consumed in the same period, while the intertemporal substitutability is more generally specified.³⁾ The young consumer's problem is thus

$$(1) \quad \max u\left(\left(\sum_j c_j\right)^{\frac{\alpha}{\alpha-1}}, \left(\sum_j d_j\right)^{\frac{\alpha}{\alpha-1}}\right), \quad 0 < \alpha < 1$$
$$\text{s.t. } \sum_j p_j c_j + \sum_j q_j d_j \leq Y_1 + Y_2$$

where c_j and d_j are present and future (period 2) consumption of good j , p_j and q_j are corresponding prices, and y_t is income in period t . The index j covers all home-produced and imported goods. Future income and prices are in present value terms.

3) The specification has some similarities to the CES-case in Dixit and Stiglitz (1977), but there are also obvious differences, since their model is atemporal.

Let us assume that the utility-function $u(\cdot)$ is homothetic. Then the formulation (1) allows a three-stage procedure which proves to be convenient in the analysis. At the first stage the consumer determines how total spending is to be divided between the periods. Secondly, the CES-function makes it possible to find the share of the period 1 budget that will be spent on home-produced goods, and finally having established this, the demand for individual products is easily found. This procedure, especially the second step, may seem to be unnatural from the consumer's point of view; home- and foreign-produced goods enter the utility-function in an identical manner, and the elasticity of substitution between any pair of commodities is the same irrespective of where the goods are produced. The point is, however, that no matter how the consumer performs (1) the results must be the same as those we get, and the three-stage procedure is analytically convenient. The optimization then runs like this:

Stage 1 Define

$$(2) \quad \begin{aligned} c &= \left(\sum_j c_j^\alpha \right)^{\frac{1}{\alpha}} \\ p &= \left(\sum_j p_j^{-\beta} \right)^{-\frac{1}{\beta}} \\ d &= \left(\sum_j d_j^\alpha \right)^{\frac{1}{\alpha}} \\ q &= \left(\sum_j q_j^{-\beta} \right)^{-\frac{1}{\beta}}, \end{aligned}$$

where $\beta = \frac{\alpha}{1-\alpha}$. Then for optimum quantities we have $p c = \sum_j p_j c_j$ and equivalently for $q d$, and (1) may be written

$$(1') \quad \begin{aligned} & \max u(c,d) \\ & \text{s.t. } p c + q d \leq y_1 + y_2 \equiv Y \end{aligned}$$

where the u -function is the same as in (1). The homotheticity of $u(\cdot)$ yields

$$p c = \phi\left(\frac{p}{q}\right) Y$$

$$q d = [1 - \phi\left(\frac{p}{q}\right)] Y$$

in optimum. Thus, the share of lifetime income that will be spent in period 1, is simply a function of relative (present value) prices, when properly defined price-indices are used. However, since we restrict the analysis to stationary solutions (and perfect foresight), p/q is constant, and $\phi(\cdot)$ can be treated as a constant fraction, ϕ .

Stage 2. Having established total spendings in period 1, we must now look at the composition of c . There are n different home-produced (h) goods, indexed h_1, \dots, h_n , and n_f imported (f) goods, f_1, \dots, f_{n_f} . The set of commodities consumed in period 1 is thus

$$\{c_j\} = \{c_{h_1}, \dots, c_{h_n}, c_{f_1}, \dots, c_{f_{n_f}}\}.$$

Define

$$(3) \quad \begin{aligned} c_h &= \left(\sum_{j=1}^n c_{hj}^\alpha \right)^{\frac{1}{\alpha}} \\ p_h &= \left(\sum_{j=1}^n p_{hj}^{-\beta} \right)^{-\frac{1}{\beta}} \\ c_f &= \left(\sum_{j=1}^{n_f} c_{fj}^\alpha \right)^{\frac{1}{\alpha}} \\ p_f &= \left(\sum_{j=1}^{n_f} p_{fj}^{-\beta} \right)^{-\frac{1}{\beta}} \end{aligned}$$

Then $c = (c_h^\alpha + c_f^\alpha)^{\frac{1}{\alpha}}$, and the second stage of the optimization is

$$(4) \quad \begin{aligned} \max_{c_h, c_f} & \quad (c_h^\alpha + c_f^\alpha)^{\frac{1}{\alpha}} \\ \text{s.t.} & \quad p_h c_h + p_f c_f = \phi y, \end{aligned}$$

yielding

$$(5) \quad \begin{aligned} p_h c_h &= h\left(\frac{p_h}{p_f}\right) \phi y \\ p_f c_f &= \left[1 - h\left(\frac{p_h}{p_f}\right)\right] \phi y \end{aligned}$$

in optimum. Properties of $h(\cdot)$ will be important, and some points may be established at once. By performing (4) it is easy to see that

$$h(\rho) = (1 + \rho^\beta)^{-1}$$

where $\rho \equiv p_h/p_f$. Then, denoting the elasticity of h w.r.t. ρ (\tilde{h} ⁴), we have

$$(6) \quad \tilde{h} = -\frac{\alpha}{1-\alpha} (1-h(\rho)).$$

Knowing that $0 < h(\rho) < 1$ and $0 < \alpha < 1$, we get $\tilde{h} < 0$.

4) Throughout the paper tilde, \sim , indicates elasticity. Furthermore, if x is a function of y_1, \dots, y_n , a subscript indicates which (partial) elasticity we consider, i.e.

$$\tilde{x}_{y_i} \equiv \frac{\partial x}{\partial y_i} \frac{y_i}{x}.$$

Stage 3. Carrying the same kind of procedure one step further using the definitions in (3), we finally get demand for individual products

$$(7) \quad c_{hi} = \left(\frac{p_h}{p_{hi}} \right)^{\frac{1}{1-\alpha}} c_h \quad \text{all } i,$$

and equivalent expressions for f-goods.

(7) will be used when we study the firms' price policies. In the general equilibrium analysis, however, the appropriate level of aggregation is the one from stage 2, i.e. where we distinguish between home-produced and imported goods, after allowing properly for the impact of individual prices on the price indices p_h and p_f . Actually what we shall do is to assume that all domestic firms face identical production- and cost-conditions, and that they behave symmetrically. Then the individual h-prices are equal, and the aggregate price p_h will depend on the individual price, say p_{hi} , and the number of varieties, n . We have

$$\begin{aligned} p_h &= \left(\sum_{j=1}^n p_{hj}^{-\beta} \right)^{-\frac{1}{\beta}} \\ &= \left(n p_{hi}^{-\beta} \right)^{-\frac{1}{\beta}} \\ &= n^{-\frac{1}{\beta}} p_{hi} . \end{aligned}$$

Equivalent assumptions regarding symmetry abroad yield

$$p_f = n_f^{-\frac{1}{\beta}} p_{fi} .$$

Then

$$\rho = \left(\frac{n}{n_f} \right)^{-\frac{1}{\beta}} \frac{p_{hi}}{p_{fi}}$$

and it is not difficult to assess effects of changes in n (or n/n_f)⁵⁾, p_{hi} or p_{fi} on the fraction of total income spent on domestically produced goods, $h(\rho)$. Using (6) we get

$$\tilde{h}_{p_{hi}} = \tilde{h} < 0$$

$$\tilde{h}_{p_{fi}} = -\tilde{h} > 0$$

$$\begin{aligned} \tilde{h}_n &= -\frac{1}{\beta} \tilde{h} \\ &= 1-h(\rho) > 0. \end{aligned}$$

Thus an increase in the number of domestic firms increases total spending on h-goods, at constant income. The reason is that the aggregate price-level p_h is reduced when n increases.

The last result hinges on the fact that the elasticity of substitution remains the same when the number of varieties varies. One might alternatively argue that increasing the number of products would affect the substitutability. Dixit and Stiglitz (1977) defend the use of constant elasticity by claiming that one might consider the range of potential products as very large; those varieties that are being produced thus constitute a small subset of the potential commodity set, and a change in this subset does not necessarily have to affect α . In our context we may go a little further and argue that a change in n may be interpreted only as a change in the relative number of h-goods in the commodity-bundle, keeping the total number of varieties ($n+n_f$) constant. With such an interpretation there will be no particular reason to expect α to change with n . However, bearing this possible interpreta-

5) It will be assumed that $n \in R_+$. As n is the number of different varieties it should of course be an integer, but taking n as a real number simplifies matters substantially and if the number of goods is large this simplification should not be too serious.

tion in mind, we will, for simplicity, in the analysis consider the number of imported commodities, n_f , as exogenously given.⁶⁾

The discussion so far has been concerned with the young generation's behaviour; in principle all the variables should have had a superscript y indicating this, e.g. c_h^y , c_f^y , h^y , y^y , etc. Turning now to the demand from the representative old consumer (indicated by superscript o), I will keep the specification as close to the discussion above as possible. There is only one major difference between the old and the young, and that is that the old consumer is in the second, and last, period of life⁷⁾, and thus has no intertemporal optimization problem. He may have an initial money stock, m^o , which is equal to the amount saved last period. In other respects it will be assumed that the young and the old consumers are identical.

The old consumer has a CES utility function with parameter α , and a two-step procedure yields

$$p_h c_h^o = h(\rho)(y^o + m^o)$$

$$p_f c_f^o = [1-h(\rho)](y^o + m^o)$$

at the first stage, and $c_{hi}^o = \left(\frac{p_h}{p_{hi}}\right)^{\frac{1}{1-\alpha}} c_h^o$ at the second.

Due to identical CES-functions, $h(\rho)$ is the same for both generations. Total domestic demand in period 1 then becomes

6) Krugman (1982) gives an alternative justification for the use of constant elasticity. He stresses that diversity is assessed as valuable, and that the positive effects that follow from an increase in n reflect this value of diversity.

7) Once again, no uncertainty exists in the model; the lifetime is thus exogenously given.

$$c_h \equiv c_h^Y + c_h^O$$

$$= \frac{1}{p_h} h(\rho) \left[\phi \left(\frac{p}{q} \right) y^Y + y^O + m^O \right]$$

and

$$c_f \equiv c_f^Y + c_f^O$$

$$= \frac{1}{p_f} [1-h(\rho)] \left[\phi \left(\frac{p}{q} \right) y^Y + y^O + m^O \right].$$

Income conditions are important. Let total domestic income in period t be y_t , and assume, for the sake of simplification, that a fixed fraction, τ , of this is earned by the young generation⁸⁾. Then expected lifetime income for a person being young in period t is

$$y_t^Y = \tau y_t + (1-\tau)y_{t+1}$$

With stationarity $y_t = y_{t+1} \equiv y$, and

$$y^Y = \tau y + (1-\tau)y = y.$$

Furthermore, $y^O = (1-\tau)y$, and we get

$$c_h = \frac{1}{p_h} h(\rho) \left[\phi \left(\frac{p}{q} \right) y + (1-\tau)y + m^O \right]$$

$$= \frac{1}{p_h} h(\rho) \left[(1+\phi-\tau)y + m^O \right].$$

8) In overlapping generation models it is often assumed that only the young generation earns money; the old consumers spend their savings. This amounts to having $\tau = 1$ in my model. As long as we study stationary solutions the size of τ is immaterial; if, however, we want to look at non-stationary problems, the choice of τ may be important. With $\tau < 1$ income expectations have a role to play, while with $\tau = 1$ future income is irrelevant for the agents living today.

Define $\sigma = 1 + \phi - \tau$. Then σ is the average (between the generations) propensity to consume out of present income. In addition, the old consumer spends his entire money stock on consumption goods, since he is in his last period. Then

$$(8) \quad c_h = \frac{1}{P_h} h(\rho)(\sigma Y + m^0)$$

and

$$(9) \quad c_f = \frac{1}{P_f} [1 - h(\rho)](\sigma Y + m^0).$$

2.2 DEMAND FROM ABROAD

Foreign equivalents of all the domestic variables defined above will be given as capital letters. Thus C_{hj} is the foreign demand for h-goods no. j, Σ is the foreign average propensity to consume, etc.

All h-goods are traded internationally, and demand abroad is assumed to be the result of a utility maximizing procedure identical to the one discussed for domestic demand. Furthermore, we assume that the parameter α is the same at home and abroad⁹⁾. Then, by direct reference to (8) and (9), we get

$$(10) \quad P_h C_h = H(P)(\Sigma Y + M^0)$$

$$(11) \quad P_f C_f = [1 - H(P)](\Sigma Y + M^0)$$

where the values are given in foreign currency.

9) Different α on different markets renders price discrimination an optimum policy. Such situations, in a short-run context, were analysed in Haaland (1982).

2.2.1 Smallness and openness.

The $H(\cdot)$ function is identical to $h(\cdot)$ since both functions result from the same optimization procedure, with identical parameter α . But then, if the perceived relative prices, ρ and P , were equal, the budget share going to h -goods would be the same at home and abroad, and furthermore, they would both have to be of negligible magnitude, due to the 'small country'-assumption. It is no problem to accept that H is negligible; otherwise the country wouldn't be small. It is, however, not so easy to feel content with the conclusion that home-produced goods are of no importance to the domestic consumers. Even if one expects the propensity to import to be high in such an economy, it seems unrealistic to conclude that it is almost equal to unity. It would be far more satisfactory if, under reasonable assumptions, we could have $h > H$, and the following argument shows that this is actually possible.

If we retain the assumption that preferences are identical, a necessary and sufficient condition for $h(\rho) > H(P)$ is that $P > \rho$, since $H'(\cdot) < 0$. Remembering that ρ and P depend both on relative prices and numbers of varieties, the condition turns out to be reasonable. If we assume symmetric products, we have

$$\rho = \left(\frac{n}{n_f}\right)^{-\frac{1}{\beta}} \frac{P_{hi}}{P_{fi}}$$

$$P = \left(\frac{N}{N_f}\right)^{-\frac{1}{\beta}} \frac{P_{hi}}{P_{fi}} .$$

Suppose further that there is no price discrimination. Then

$$P_{hi} = \varepsilon P_{hi}$$

$$P_{fi} = \varepsilon P_{fi}$$

for all individual prices, where ε is the exchange rate. But

then $P > p$ if and only if $n/n_f > N/N_f$. We have already assumed that $n = N$, i.e. that all domestic products are traded internationally; hence the condition becomes $n_f < N_f$. To me it does not seem to be unreasonable to assume that this condition is satisfied. It says that among the large number of differentiated commodities that are produced and consumed in the world, only a limited number of varieties are exported to the small country in question. Hence, as far as trade between our small country and the rest of the world is concerned, a number of the foreign commodities may be considered as non-traded, and in this sense we may say that the large country is relatively less open than the small one. The question of openness is, however, more thoroughly discussed in Essay no. 4; here it suffices to say that throughout this paper we will assume that both n_f and N_f are exogenously given, and that $n_f < N_f$. Then we know for sure that $h > H$.

The fact that we study a small country implies that foreign income and money stock may be considered as independent of what happens in our economy. National income abroad (i.e. in the "rest of the world") is equal to the value of production of f-goods, measured in foreign currency, and the following simplifications may be justified by reference to the 'small country'-assumption :

$$\begin{aligned} Y &= \frac{P_f}{\varepsilon} c_f + P_f C_f \\ &\approx P_f C_f \\ &= [1 - H(P)] (\Sigma Y + M^0) \\ &\approx \Sigma Y + M^0. \end{aligned}$$

Hence, demand for h-goods from abroad, measured in domestic currency, may be written

$$(12) \quad \varepsilon P_h C_h = \varepsilon H(P) Y,$$

where Y is considered as exogenously given.

2.3 INCOME

National income is equal to the value of domestic production:

$$y = p_h c_h + \varepsilon P_h C_h.$$

Using (8) and (12) we get

$$y = h(\rho)(\sigma y + m^0) + \varepsilon H(P) Y$$

$$(13) \quad y = \frac{1}{1-h(\rho)\sigma} [h(\rho)m + \varepsilon H(P)Y]$$

In (13) m is the domestic money stock, and $m^0 = m$ has been used, since the old consumer is the only one that holds money.

It is necessary to require $h\sigma < 1$, otherwise it will be impossible to get stable solutions. However, as $h(\rho)$ is a continuous function over $\langle 0, 1 \rangle$, we need $\sigma < 1$ to ensure $h\sigma < 1$ for all ρ . Remembering that $\sigma = 1 + \phi - \tau$, this is equivalent to $\tau > \phi$, i.e. we have to assume that the young consumer's income exceeds his spendings. As the sole purpose of using an overlapping generation framework was to make possible the introduction of uneven income- or spending-profiles, it should be perfectly legitimate to assume $\sigma < 1$.

From the last section we know that Y may be considered as exogenously given. The domestic money stock m , will be discussed thoroughly later; for the time being it can be thought of as an exogenous variable.

In the analysis it will be important to know how y varies with p_{hi} , p_{fi} and n . These work through changes in ρ and P and it is easy to see that the relative changes in ρ and P are always the same. Thus, when we take the elasticity of y w.r.t. ρ it

is implicitly assumed that P changes proportionally. This yields

$$\begin{aligned}\tilde{Y}_\rho &= \frac{m + \sigma Y}{1 - h\sigma} \cdot h'(\rho) \cdot \frac{\rho}{Y} + \frac{\varepsilon Y}{1 - h\sigma} \cdot H'(P) \cdot \frac{P}{Y} \\ &= \frac{1}{1 - h\sigma} \left(\frac{P_h^C h}{Y} \cdot \tilde{h} + \frac{\varepsilon^P h^C h}{Y} \cdot \tilde{H} \right)\end{aligned}$$

Let $\eta = \frac{P_h^C h}{Y}$; then $\frac{\varepsilon^P h^C h}{Y} = 1 - \eta$. Using this, \tilde{h} from (6) and an equivalent expression for \tilde{H} , we finally get

$$(14) \quad \tilde{Y}_\rho = - \frac{\alpha}{1-\alpha} \cdot \frac{1 - \eta h - (1-\eta)H}{1 - h\sigma},$$

which is negative as long as $h\sigma < 1$, since $0 < h < 1$ and $0 < H < 1$. Further, we have

$$\tilde{Y}_{P_{hi}} = \tilde{Y}_\rho < 0$$

$$\tilde{Y}_{P_{fi}} = - \tilde{Y}_\rho > 0$$

and

$$\tilde{Y}_n = - \frac{1-\alpha}{\alpha} \tilde{Y}_\rho > 0.$$

2.4 SUPPLY

The supply-side is in principle identical to the one discussed in Essay no. 2. The solution is, however, simplified by the fact that we only study stationary equilibria, because this implies that we can ignore the possibility of changing inventory-levels, and may thus consider the firms' behaviour as resulting from a one-period profit maximization problem.

Domestic demand for firm i 's product is given in (7). This may be rewritten as

$$P_{hi} = P_h c_h^{1-\alpha} c_{hi}^{\alpha-1}$$

Being small, and assuming that the competitors keep their prices and quantities unchanged, the firm considers p_h and c_h as given and unaffected by its own adjustments. The relevant inverse demand function (the dd-function) is then

$$(15) \quad P_{hi} = \gamma_i c_{hi}^{\alpha-1}$$

Equivalently, the firm faces a demand on the foreign market equal to

$$(16) \quad \varepsilon P_{hi} = \varepsilon \Gamma_i c_{hi}^{\alpha-1},$$

measured in domestic currency.¹⁰⁾

Each period the firm produces a quantity x_i , and in equilibrium we must of course have $x_i = c_i + C_i$. Labour is the only input in the production, and the labour requirement for firm i is

$$(17) \quad l(x_i) = \mu x_i + \kappa.$$

The fixed component, κ , is assumed to be the same for all firms, and the only way to get rid of these fixed costs, is by going out of business. The marginal labour requirement, μ , and thereby the marginal cost, is for simplicity taken to be constant.

10) It will be assumed that the firm considers Γ_i as constant. Alternatively, the domestic value, $\varepsilon \Gamma_i$, might be taken as exogenous; the difference is, however, not important for the results.

Profit is given by

$$\pi^i = p_{hi} c_{hi} + \epsilon p_{hi} c_{hi} - w \cdot \lambda(c_{hi} + C_{hi}).$$

Maximizing π^i subject to (15) and (16) yields

$$p_{hi} = \frac{1}{\alpha} \lambda'(c_{hi} + C_{hi}) \cdot w$$

$$\epsilon p_{hi} = \frac{1}{\alpha} \lambda'(c_{hi} + C_{hi}) \cdot w.$$

The optimum prices are thus fixed markups over marginal costs. As long as the perceived elasticity of demand is the same in both markets, the markup will be the same as well. Furthermore, from (17) we have $\lambda'(\cdot) = \mu$, yielding

$$(18) \quad p_{hi} = \epsilon p_{hi} = \frac{\mu}{\alpha} w.$$

At these prices the firm must, of course, make sure that expected profits are non-negative; otherwise it is better off by staying out of business.

What about quantities? Planned production at the optimum prices depends on γ_i and Γ_i , i.e. on the firm's perception of the market conditions. In general these quantities may deviate from actual demand (i.e. there is a difference between the dd- and the DD-curve), and in such cases we assume that the firm changes its supply to cover the actual demand. Deviation between actual and planned sales is likely to affect the firm's perception of market conditions, which means that γ_i and Γ_i will be adjusted, and in long run stationary equilibrium γ_i and Γ_i must be such that actual and planned production coincide.

Demand for labour, l , is the sum of the labour requirements in the individual firms. The firms have identical production functions, and we get

$$\begin{aligned} l &= \sum_{i=1}^n l(c_{hi} + c_{hi}) \\ &= \sum_{i=1}^n [\mu(c_{hi} + c_{hi}) + \kappa] \\ &= \mu \sum_{i=1}^n (c_{hi} + c_{hi}) + n\kappa. \end{aligned}$$

But we know that

$$\begin{aligned} Y &= \sum_{i=1}^n P_{hi}(c_{hi} + c_{hi}) \\ &= \sum_{i=1}^n \frac{\mu}{\alpha} w(c_{hi} + c_{hi}) \\ &= \frac{\mu}{\alpha} w \sum_{i=1}^n (c_{hi} + c_{hi}) \end{aligned}$$

implying

$$(19) \quad l = \alpha \frac{Y}{w} + n\kappa.$$

Labour supply is exogenously given as \bar{l} .

3. LONG RUN STATIONARY EQUILIBRIUM

Applying the expressions for optimum prices and quantities, the exogeneity-assumptions (of P_f , n_f and N_f), and the stationarity, as described above, long run stationary equilibrium (LRSE) is ensured if the following three conditions are satisfied:

$$(20) \quad z \equiv l - \bar{l} = 0$$

$$(21) \quad b = 0$$

$$(22) \quad \pi^n = 0$$

where z is excess demand for labour, and b is the balance of payments. (20)-(22) determine w , n and either m (with fixed exchange rate) or ε (in which case we may consider m as exogenously fixed).

(20) says that there must be full employment in LRSE. Using (19), z may be written

$$z = \alpha \frac{Y}{w} + nk - \bar{l}.$$

In (21) we require balanced trade in LRSE. This essentially amounts to requiring stock equilibrium in the money market. b may be expressed as the excess demand for money; if $b \neq 0$ there will be endogenous changes in the money stock over time, and the economy cannot be in stationary equilibrium.

The balance of payments can be expressed in many equivalent ways. Starting from the trade definition we may proceed like this:

$$\begin{aligned} b &= \varepsilon P_h C_h - P_f C_f \\ &= \varepsilon P_h C_h + P_h c_h - (P_h c_h + P_f C_f) \end{aligned}$$

$$\begin{aligned}
 &= y - p c \\
 &= y - (\sigma y + m) \\
 &= (1-\sigma)y - m .
 \end{aligned}$$

Finally (22) is the free entry/exit condition; it says that the marginal firm should have zero profit¹¹⁾ in LRSE. However, due to the symmetry-assumption all firms earn identical profits in our model, and (22) can be reformulated as $\pi^i = 0$, all i . We have

$$\begin{aligned}
 \pi^i &= P_{hi} c_{hi} + \varepsilon P_{hi} C_{hi} - w[\mu(c_{hi} + C_{hi}) + \kappa] \\
 &= (1-\alpha)P_{hi}(c_{hi} + C_{hi}) - w\kappa \\
 &= (1-\alpha) \frac{Y}{n} - w\kappa .
 \end{aligned}$$

The system is then

$$(20') \quad z = \alpha \frac{Y}{w} + n\kappa - \bar{l} = 0$$

$$(21') \quad b = (1-\sigma)y - m = 0$$

$$(22') \quad \pi = (1-\alpha) \frac{Y}{n} - w\kappa = 0.$$

Using this system of equations we shall study characteristics of LRSE; it will be shown that equilibrium exists and is unique, and comparative static effects will be established. In most of the analysis it will be assumed that the exchange rate

11) When specifying the condition in this way, we implicitly regard n as a real number. In practice the number of firms must be an integer, and the condition is then

$$\pi^n \geq 0, \quad \pi^{n+1} < 0.$$

However, sticking to the $n \in R_+$ assumption simplifies the analysis substantially, and we will thus ignore the integer constraint.

is fixed. However, in section 5 we shall see that equivalent results can be found with flexible exchange rate.

In (20')-(22') y has got a prominent position. It should be remembered that y is a function of the other variables as given in (13), using the appropriate expression for ρ ; it may thus be written: $y = y(w, n, m, \varepsilon, P_f, Y, n_f, N_f)$. In (14) \tilde{y}_ρ was established; a few additional points about y will be made here and these essentially relate properties of y to the Chamberlinian DD-curve discussed earlier.

We have

$$\begin{aligned} y &= \sum_{i=1}^n p_{hi} (c_{hi} + C_{hi}) \\ &= \frac{\mu}{\alpha} w \sum_{i=1}^n (c_{hi} + C_{hi}) \\ &= \frac{\mu}{\alpha} wn (c_{hi} + C_{hi}) \end{aligned}$$

yielding

$$(23) \quad c_{hi} + C_{hi} = \frac{\alpha Y}{\mu wn} .$$

But this is the (generalized) DD-curve for firm i , and thus for all firms, since they behave symmetrically. The DD-elasticity, el_{DD} , is the elasticity of (23) w.r.t. p_{hi} ; however, as $p_{hi} = \frac{\mu}{\alpha} w$ and $\frac{\mu}{\alpha}$ is a constant, we may as well take the elasticity w.r.t. w , yielding

$$\begin{aligned} el_{DD} &= \left(\frac{\tilde{y}}{w} \right)_w \\ &= \tilde{y}_w - 1 \\ &= - \frac{\alpha}{1-\alpha} \frac{1-\eta h - (1-\eta)H}{1-h\sigma} - 1 \\ &= - \frac{1}{1-\alpha} - \frac{\alpha}{1-\alpha} \left[\frac{1-\eta h - (1-\eta)H}{1-h\sigma} - 1 \right] . \end{aligned}$$

From (15) and (16) it is easy to see that the demand elasticity perceived by the producer, the dd-elasticity, is $-\frac{1}{1-\alpha}$. But then we can conclude that

$$(24) \quad |el_{DD}| < |el_{dd}| \quad \Leftrightarrow \quad \frac{1-\eta h-(1-\eta)H}{1-h\sigma} < 1,$$

i.e. the DD-curve is less elastic than the dd-curve if and only if the right-hand side inequality is satisfied.

Related to this is the effect on DD of a change in n:

$$\begin{aligned} \left(\frac{\tilde{Y}}{n}\right)_n &= \tilde{Y}_n - 1 \\ &= \frac{1-\eta h-(1-\eta)H}{1-h\sigma} - 1. \end{aligned}$$

Using (24) we have

$$(25) \quad \left(\frac{\tilde{Y}}{n}\right)_n < 0 \quad \Leftrightarrow \quad |el_{DD}| < |el_{dd}|.$$

This result is neither new nor surprising (see e.g. Dixit and Stiglitz (1977)). Usually one assumes that the elasticity-condition is satisfied; then the first inequality in (25) follows, and as this often is a necessary condition for uniqueness and stability of equilibrium, such a result is very useful. In our context this line of argument is modified in two ways, both stemming from the general equilibrium framework. Firstly, (25) is not a necessary condition for uniqueness or stability, and, secondly, from (24) we see that it is far from obvious that DD will be less elastic than dd. Assuming for a moment that $H = 0$, the condition becomes $\eta > \sigma$, and there is no reason why this condition should be satisfied in general. Nevertheless, we will actually in most of the analysis assume that it is satisfied, as this simplifies matters substantially.

4. FIXED EXCHANGE RATE

With fixed exchange rate we have to regard m as an endogenously determined variable. This is one of the most important lessons to be learned from the so-called monetary approach to the balance of payments (see e.g. Frenkel and Johnson (1976)), and it is a point that seems to be approved of even by the critics of the approach, e.g. Hahn (1977). If then the ultimate equilibrium position is the only thing of interest, it is possible to proceed as follows: From (21) the equilibrium money stock, m^e , can be calculated as $m^e = (1-\sigma)y$; inserting this in the expression for y in (13) yields $y^m = \epsilon HY / (1-h)$, where superscript m indicates the endogeneity of money. In this way the y -function is simplified, m is eliminated, and we are left with two equations to determine the two unknown variables, w and n . Below, this strategy will be applied in the study of some comparative static effects.

If, however, we are interested in any phenomena out of equilibrium, it is far from obvious that the y^m - expression is the one that should be applied. y^m is only valid when we have $b = 0$ at the actual levels of prices and activity, and there is no particular reason to expect this to be the case if there is disequilibrium elsewhere in the economy. Thus, using y^m implies that we make strong assumptions regarding the 'speed of adjustment' in the money market; actually it means that the money market adjusts immediately to the balanced trade level whenever there is a change in w or n .

It turns out to be more convenient to start with another, and equally unrealistic assumption, namely that the money stock is held constant during each period, but that it may change from period to period if there is trade imbalance. This does not imply that I reject the idea of endogenous money stock in LRSE; what it does mean is that I think it may be instructive to study situations with different levels of m , not only with

$m = m^e$. It may be interesting to get an idea of the adjustment process towards LRSE, and this cannot be done if the money market is assumed to be in equilibrium all the time.

Our first purpose, then, is to characterize the equilibrium conditions for a given level of m . We shall find three loci in the (w, n) -space, representing, respectively, the $b = 0$, the $\pi = 0$ and the $z = 0$ condition. Using this characterization, and also some further simplifications, we shall establish comparative static effects, and in addition look at an example of how the economy may behave when it is out of equilibrium.

4.1 CHARACTERIZATION OF EQUILIBRIUM

Figure 1 shows the three equilibrium conditions for different levels of m . All three loci depend on m , and only figure 1.a shows a stationary equilibrium. Note that the units are in logarithms; this simplifies the exposition, as will become clear below.

Starting with the balanced trade condition (21), we see that for each given level of m we need $y = m/(1-\sigma)$ to ensure $b = 0$. But a glance at (13) reveals that we may write $y = y(p_h, m, \epsilon P_f, \epsilon Y)$, so to keep y constant in nominal terms we need constant p_h . Thus the $b = 0$ locus (or more generally an "iso- b " locus, i.e. a locus along which b is constant) is given by the combinations of w and n that keep p_h unchanged at the appropriate level. We have

$$p_h = n^{-\frac{1-\alpha}{\alpha}} \frac{\mu}{\alpha} w,$$

yielding

$$(26) \quad \left. \frac{dw}{dn} \right|_{b=0} = \frac{w}{n} \frac{1-\alpha}{\alpha}$$

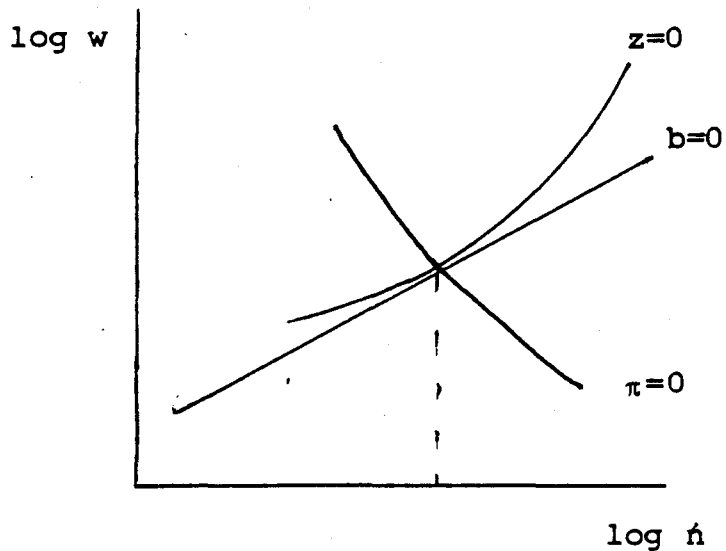


Figure 1.a

$$m = m^e$$

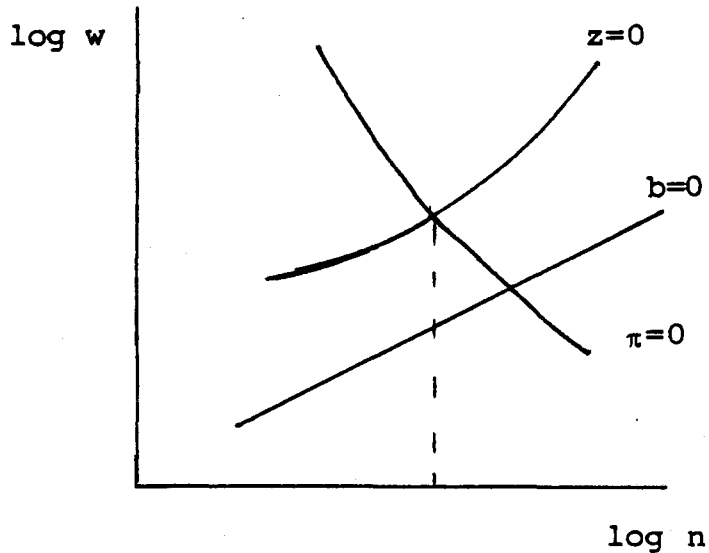


Figure 1.b

$$m > m^e$$

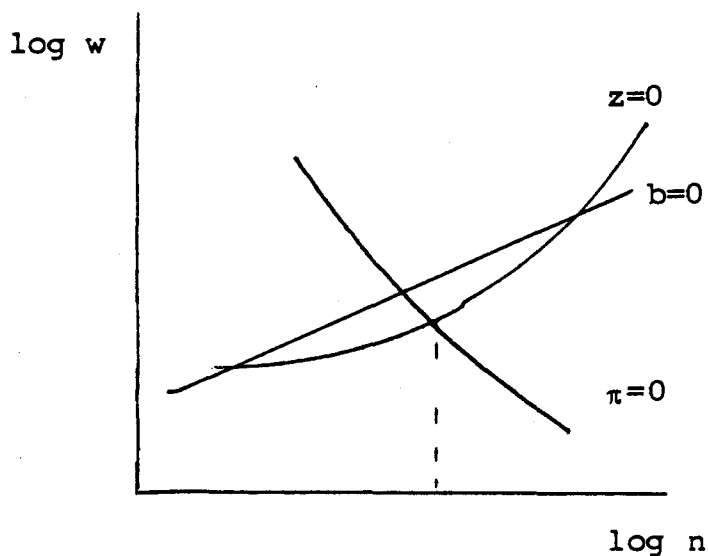


Figure 1.c

$$m < m^e$$

or, in logarithms $\frac{d(\log w)}{d(\log n)} = \frac{1-\alpha}{\alpha}$. This is the $b = 0$ locus in figure 1. Its actual position depends on the exogenous variables and on the prespecified level of m . There is trade surplus below the curve, and deficit above it. An increase in the money stock shifts the locus downwards. This follows because $db/dm < 0$.

Now, let us study the zero profit condition (22). A locus along which $\pi = 0$ must have the slope

$$(27) \quad \left. \frac{dw}{dn} \right|_{\pi=0} = - \frac{\pi_n}{\pi_w} \\ = - \frac{w}{n} \frac{\tilde{y}_n - 1}{\tilde{y}_w - 1}$$

where π_n and π_w are partial derivatives of the π -function in (22). π_w is always negative; π_n is negative if condition (25) is satisfied, i.e. if the DD-curve is less elastic than the dd-curve, in Chamberlinian terminology. We will assume this to be the case. Then $\pi = 0$ is a downward sloping locus in the (w,n) -space (and in the $(\log w, \log n)$ -space)¹²⁾. Below the locus we have $\pi > 0$, above it $\pi < 0$. An increase in the money stock increases π , ceteris paribus; the locus thus shifts upwards.

Finally the full employment condition (20) yields

$$(28) \quad \left. \frac{dw}{dn} \right|_{z=0} = - \frac{z_n}{z_w} \\ = - \frac{\frac{\alpha Y}{wn} \tilde{y}_n + \kappa}{\frac{\alpha Y}{w^2} (\tilde{y}_w - 1)} > 0.$$

12) If condition (25) is not satisfied, $\pi = 0$ will be an upward-sloping locus. It is easy to see that this locus has to be flatter than the balanced trade locus. Most of the results below will still be valid in this case, but stability may possibly be a problem.

From the $\pi = 0$ expression we find $\frac{\kappa w n}{\alpha y} = \frac{1-\alpha}{\alpha} - \frac{\pi n}{\alpha y}$. Using this, and $\tilde{y}_n = -\frac{1-\alpha}{\alpha} \tilde{y}_w$, (28) may be written

$$(28') \quad \left. \frac{dw}{dn} \right|_{z=0} = \frac{w}{n} \frac{1-\alpha}{\alpha} \left[1 - \frac{\pi n}{(1-\alpha)y(1-\tilde{y}_w)} \right].$$

With $\pi = 0$ this coincides with the slope of the "iso-b" loci. Positive π yields a flatter locus, while negative π implies that $z = 0$ is steeper than the balanced trade locus (as shown in figure 1). There is unemployment above the locus, and excess demand for labour below it. A monetary expansion shifts the curve upwards¹³⁾.

Full long run equilibrium (LRSE) requires that all three loci intersect for some combination of w and n . From the discussion above it is clear, then, that LRSE must be given by a point where there is tangency between $b = 0$ and $z = 0$, such as the point (w^e, n^e) in figure 1.a. In figure 1.b and 1.c there are no candidates for stationary equilibrium.

4.2 EXISTENCE

It is fairly easy to show that a unique LRSE exists for all $\alpha \in (0,1)$, i.e. that there is one, and only one, combination of positive values of w, n and m such that the system (20) - (22) is satisfied. Manipulating (20') and (22') reveals the following properties of the intersection of the $z = 0$ and the $\pi = 0$ locus :

$$(29) \quad n = \frac{\bar{\kappa}}{\kappa} (1-\alpha)$$

13) By now it should be clear why the use of logarithms simplifies the exposition. In the (w,n) -space the (constant elasticity) curve $b = 0$ can be concave or convex, depending on the value of α ; in the $(\log w, \log n)$ -space it is linear, and the elasticity determines its slope. The $z = 0$ locus is "less concave" than $b = 0$, implying that it must be convex when $b = 0$ is linear, i.e. when we use logarithms. In the (w,n) -space its curvature is difficult to establish. Even if we know what the balanced trade locus looks like, it is not easy to see how $z = 0$ is curved.

$$(30) \quad \frac{Y}{w} = \bar{\lambda}.$$

So the equilibrium number of firms, n^e , is independent of the money stock, and of any other nominal magnitudes. It depends only on the real value of the markup over marginal costs $[(1-\alpha)\bar{\lambda}]$ and on the fixed costs measured in real terms (κ). As long as $\bar{\lambda}$, κ and α remain unchanged, we can consider $n = n^e$ as a constant. This result is reflected in fig. 1, where the intersection of $z = 0$ and $\pi = 0$ takes place at the same level of n in all three situations.

Using n^e we are left with two equations, (21') and (30), to determine w and m . But it has already been mentioned that we can eliminate (a positive value of) m by using (21') and (13), to get

$$(31) \quad y^m = \frac{\varepsilon H(P)Y}{1 - h(\rho)}.$$

Remembering that $\rho = p_h / \varepsilon P_f$ (and equivalently for P), and that p_h is a function of n and w , we see that the only endogenous variable in y^m is w . An equilibrium exists if, and only if, there exists a (positive) value of w such that y^m/w is equal to $\bar{\lambda}$. But y^m/w is monotonously declining in w , and

$$\begin{aligned} y^m/w &\rightarrow \infty \quad \text{as } w \rightarrow 0, \\ y^m/w &\rightarrow 0 \quad \text{as } w \rightarrow \infty. \end{aligned}$$

Continuity then ensures that there is one, and only one, $w \in \langle 0, \infty \rangle$ such that $y^m/w = \bar{\lambda}$.

4.3 COMPARATIVE STATIC EFFECTS

We shall focus on the effects of changes in ϵ , P_f and Y . None of these have any influence on the equilibrium number of firms; hence, in terms of fig. 1 the effects will occur as vertical movements along the line $n = n^e$ (or, to be precise, $\log n = \log n^e$). In (29) it was established that the number of firms was a function of \bar{l} and κ . Effects of these real domestic variables are studied in a separate paper (Essay no. 4), and they will not be discussed here.

4.3.1 Devaluation.

At the fixed n^e we may write

$$z = z(w, m, \overset{-}{\epsilon} P_f, \overset{+}{\epsilon} Y; n^e, \sigma, \bar{l})$$

$$b = b(w, m, \overset{-}{\epsilon} P_f, \overset{+}{\epsilon} Y; n^e, \sigma)$$

where + or - over a variable indicates the sign of the partial derivatives. It is easy to check in (20') and (21') that z is homogeneous of degree 0, while b is linearly homogeneous in w , m , ϵP_f and ϵY . An immediate implication of this homogeneity is that a devaluation has no real effects on the long run equilibrium position in this economy. Proportional changes in all nominal magnitudes do the job of restoring equilibrium after a devaluation. If ϵ is raised by 10 %, w , m and y will also increase by 10 %, and so will the domestic price level, since both p_h and ϵP_f are increased by 10 %, and $p = p(p_h, \epsilon P_f)$ is a linearly homogenous function (see the definition of p in (2)).

Another implication of homogeneity is that a purely nominal shift abroad, i.e. a balanced change in P_f and Y , has exactly the same effect on our economy as an exchange rate change has. It is, of course, quite obvious that it must be like this, since altering the exchange rate is a means of changing all nominal values denominated in foreign currency.

Figure 2 shows the effects of a devaluation on LRSE in the (w, m) -space. Both loci shift upwards, while w^e/m^e remains unchanged.

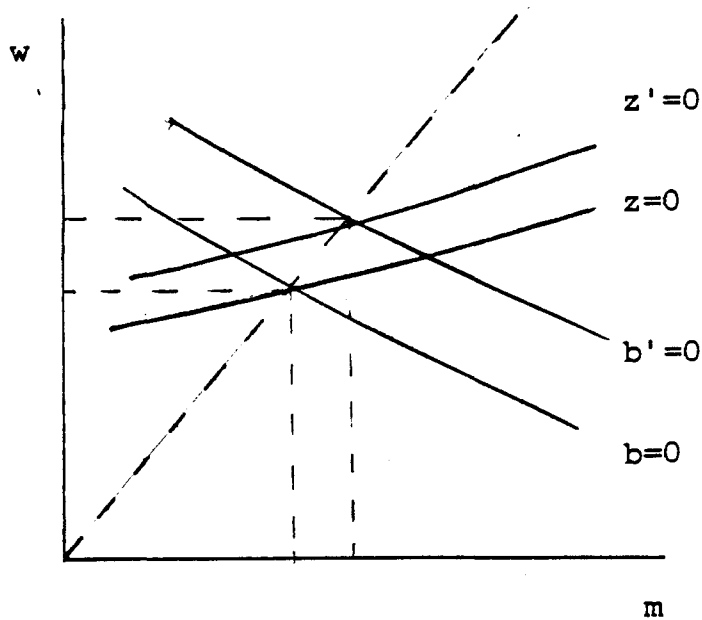


Figure 2

4.3.2 A real shift abroad.

What happens if Y or P_f is altered one at a time? The first thing to notice is that w^e/m^e still stays unchanged; this follows from (21') and (30):

$$\begin{aligned} m^e &= (1-\sigma) y \\ &= (1-\sigma) w^e \bar{l}. \end{aligned}$$

Thus a shift in P_f or in Y yields movements along the w^e/m^e -ray in figure 2. Both $dP_f > 0$ and $dY > 0$ move the equilibrium position upwards in the diagram, but the change in w (and thereby in y) is less than proportional to the foreign shock, as we know that a combined increase in P_f and Y yields a proportional change in w .

It is, however, more interesting to study the effects on real domestic income, y/p (or equivalently on real wage rate, w/p , since y/w is constant). The following result will be proved:

An increase in foreign real income, Y/P_f , raises the real domestic income y/p , but the change is less than proportional. The effect is the same whether the foreign change comes as a rise in Y or as a decline in P_f .

I will show the last part of the proposition first, namely that Y and P_f have symmetric effects on real income in our economy. If we were to specify an ad hoc model of an economy of the kind we are studying here, we would probably at the outset assume that Y/P_f is what matters, and not Y and P_f separately. However, in my model P_f comes in through its effect on relative prices, while Y measures the activity level abroad, and it is not at all obvious that these two variables have symmetric effects on long run equilibrium. Nevertheless, this turns out to be the case, which is easily shown, using homogeneity.

Remembering that n^e is given, we may proceed as in section 4.2. Income with endogenous money stock was given in (31); this may be written

$$(32) \quad y^m = v(w, \epsilon P_f, \epsilon Y)$$

where $p_h = kw$ has been used, and the constant factor, k , is suppressed in the equation. It is easy to verify from (31) that v is a linearly homogeneous function. Then we have

$$y^m = \epsilon P_f v\left(\frac{w}{\epsilon P_f}, \frac{\epsilon Y}{\epsilon P_f}\right).$$

Now, the equilibrium condition (30) may be written

$$\frac{\varepsilon P_f v\left(\frac{w}{\varepsilon P_f}, \frac{Y}{P_f}\right)}{w} = \bar{\lambda},$$

and by the Implicit Function Theorem we get (suppressing $\bar{\lambda}$ as an argument in the function)

$$\frac{w}{\varepsilon P_f} = \xi\left(\frac{Y}{P_f}\right).$$

We are interested in w/p , where p is the domestic price level. From (2) it follows that we may write $p = p(p_h, \varepsilon P_f)$, and using $p_h = kw$, we have

$$p = \phi(w, \varepsilon P_f).$$

Homogeneity of ϕ implies

$$p = \varepsilon P_f \phi\left(\frac{w}{\varepsilon P_f}\right).$$

But then we have

$$\begin{aligned} \frac{w}{p} &= \frac{w}{\varepsilon P_f} \frac{\varepsilon P_f}{p} \\ &= \xi\left(\frac{Y}{P_f}\right) \left[\phi\left(\xi\left(\frac{Y}{P_f}\right)\right)\right]^{-1} \\ &\equiv f\left(\frac{Y}{P_f}\right) \end{aligned}$$

which proves that $\frac{w}{p} = \bar{\lambda} \frac{w}{p}$ is a function of Y/P_f .

The first part of the proposition says something about the sign and magnitude of the real income effect. Having established that Y and P_f work symmetrically, we can concentrate on

the real wage effect of a change in Y . The equilibrium response in w can be calculated from (30), using (31):

$$(33) \quad \frac{dw}{dY} = \frac{w}{Y} \frac{1}{1-\tilde{Y}_w^m}$$

Thus, $0 < \frac{dw}{w} < \frac{dY}{Y}$, as $\tilde{Y}_w^m < 0$. The domestic price level increases due to the change in w , and it is not difficult to see that

$$\frac{dp}{p} = h \frac{dw}{w} .$$

The real wage effect is

$$(34) \quad \begin{aligned} \frac{d(w/p)}{w/p} &= \frac{dw}{w} - \frac{dp}{p} \\ &= \frac{1-h}{1-\tilde{Y}_w^m} \frac{dY}{Y} \end{aligned}$$

and the result is proved.

These effects are easily explained. The economy starts out from a situation with full employment and a given industry structure; thus, the total supply of h-goods is given and cannot be raised. An exogenous increase in the demand for exports then inevitably leads to excess demand for h-goods and labour, and p_h and w have to increase in order to restore equilibrium. The necessary change in the nominal wage rate, and thereby in p_h , is given in (33). The real wage increases because people spend part of their income on imports, so that the average price-level increases less than the price for home-produced commodities. The real effect is bigger the larger the import propensity, $1-h$, is.

4.4 OUT OF EQUILIBRIUM - AN EXAMPLE.

This section gives an example of how the economy may behave out of equilibrium. I do not pretend to give a full treatment of all possibilities; I will only sketch one example of how the model may be used to analyse disequilibrium situations. The example also indicates that the adjustment process towards equilibrium may be troublesome.

It should be emphasized that the model, at its present stage, isn't really suitable for analysis of situations other than stationary equilibrium. Both for consumers and for producers we, basically, eliminated all intertemporal problems by reference to the stationarity assumption. Consumers expect price- and income-conditions to remain unchanged, producers see no reason to invest or to change their inventory levels, etc. If we stick to these simplifications when the economy moves away from LRSE, this implicitly implies that we alter our assumptions in one of two possible ways: either we drop the rational expectation assumption and supply the agents with rigid, non-rational expectations, or else we assume, for some reason, that intertemporal considerations are not all that important for aggregate values. Both possibilities represent serious limitations to the general validity of the results, so the example below must be taken only as a tentative indication of the kind of problems that may arise. In principle, it is no problem to use the model to analyse non-stationary situations, but to do this properly we need a good theory of the expectation formation process, and this is beyond the scope of this paper.

Now, back to our example. Suppose the situation is as in figure 3. From the discussion so far we know that $m < m^e$ in this situation (see fig.1.c) and that the final LRSE-position must be along $n = n^e$, somewhere between the points A and C. Assume that the economy at the outset is in position A. From the diagram it is of course easy to see that what is needed to

cure the disequilibrium is an increase in the money stock and a fall in the nominal wage rate. As A was chosen to lie at $n = n^e$ there is no need for adjustment in the number of firms.

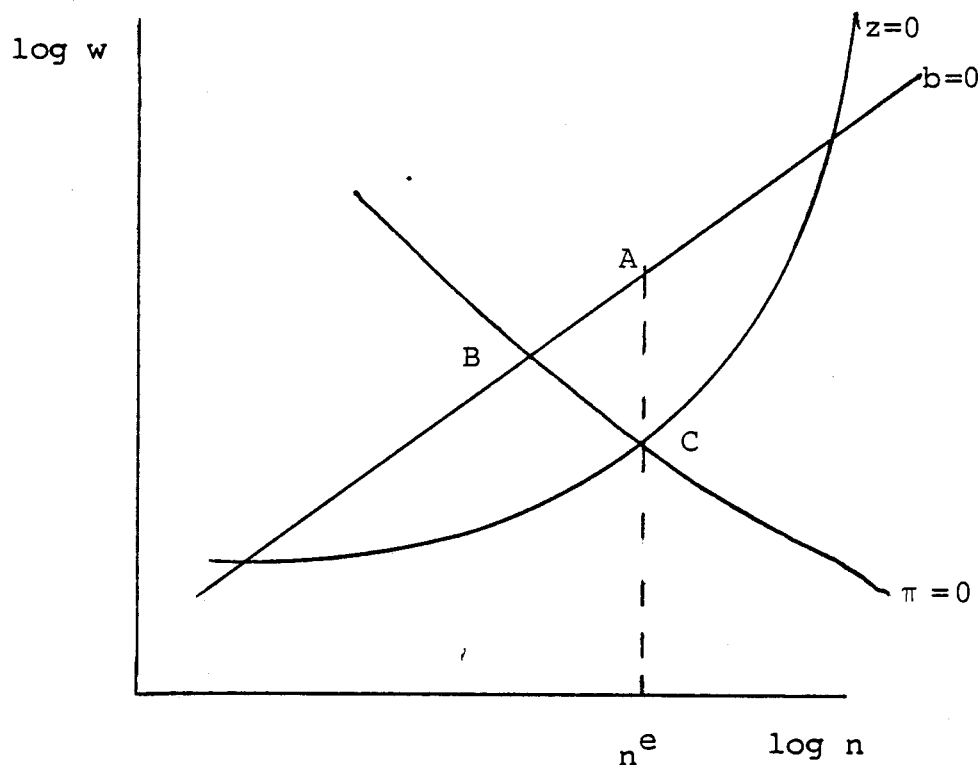


Figure 3.

In practice, it is not likely that the adjustment process will be as smooth as indicated above. In A there is unemployment and firms experience losses, while the foreign trade is in balance. But then there will probably be a tendency for firms to go out of business, and there may also be downward pressure on the wage rate. The money market is, however, in (temporary) equilibrium; at the actual level of prices and activity the young consumer wants to save exactly the same amount of money as the old consumer spends, and no net saving takes place. Then there will be no automatic adjustment in the money stock as long as the economy stays in position A, even though we have seen that the actual stock of money is less than the LRSE level, m^e .

Let us now, for the sake of simplicity, assume that the endogenous variables are adjusted once every period in response to disequilibrium phenomena, and that they then stay unchanged until the next adjustment, one period later. The exogenous variables remain constant throughout the analysis. Starting from position A in the diagram, a movement in southwesterly direction can be expected during the first period. The money stock remains at the same level, and this implies that all three loci are placed in the same position at the end of period 1 as they were initially. Exactly where the economy ends up after the first round of adjustments has taken place, depends on the flexibility or rigidity of w and n .

As long as the new position is southwest of A, it is easy to see from the diagram that profits will increase from period 1 to period 2. What happens to employment and balance of payments is not so clear. Depending on the relative speed of adjustment of n and w the economy may end up on, above, or below the $b = 0$ locus, and the consequences for the balance of payments can be read directly from the diagram. The employment effects need more consideration. The easiest case to analyse is the one where the movement takes place along the balanced trade locus; it will be shown that such adjustment actually raises the unemployment, even though it implies a reduction in the real as well as in the nominal wage rate.

Along the b -locus p_h and y remain constant. Then, as excess demand for labour is $z = \alpha (y/w) + n\kappa - \bar{l}$, we get

$$\begin{aligned}
 dz &= \alpha \left(-\frac{y}{w^2} \right) dw + \kappa dn \\
 &= \left[-\alpha \frac{y}{w^2} \frac{\partial w}{\partial n} \Big|_{b=0} + \kappa \right] dn \\
 &= -\frac{1}{w} \left[(1-\alpha) \frac{y}{n} - w\kappa \right] dn \\
 &= -\frac{\pi}{w} dn.
 \end{aligned}$$

Thus, as long as the economy is in the $\pi < 0$ area, reductions in w and n along $b = 0$ imply a worsening of the unemployment. All firms that stay in business increase their scale of production and thereby the demand for labour, but this is outweighed by the fall in employment due to the reduction in the number of firms. Actually, the total production in physical terms, nx (where x is production level in a representative firm), increases, so the fall in employment stems entirely from the increasing returns to scale in the production function. The growth in nx follows from

$$\begin{aligned} y &= p_h (c_h + C_h) \\ &= \sum p_{hi} (c_{hi} + C_{hi}) \\ &= \frac{\mu}{\alpha} w n x \end{aligned}$$

Along $b = 0$ y is unchanged, so when w fall, nx has to increase.

To sum up briefly, the situation is as follows: Initially there is $\pi < 0$ and $z < 0$, but $b = 0$. This gives rise to reductions in w and n , and we take it that, by chance or for some other reason, the adjustment is such that the balanced trade position is sustained. Then, the situation in period 2 will be that firms are better off than they were in period 1 (they produce and sell more than they did, and earn more money (or lose less)), while at the same time more workers are unemployed, and those who still work earn less than they did previously (both in nominal and real terms). The money stock is the same as before, and there is still equilibrium in the money market.

What will happen in period 2? If the initial position now is somewhere on the line between A and B in fig. 3, the adjustment process may of course continue in the same way as in

period 1, leading the economy towards, or past, B where the zero profit condition is satisfied. In view of what happened to wages and employment in period 1, an alternative, and not unlikely, scenario is that w becomes less flexible than before. In this case, it may be impossible to sustain the balanced trade position, and at the end of period 2 the economy may be placed somewhere above the line between A and B. Then the unemployment situation is even worse, there are balance of trade deficits, and profitability may not have improved as much as one could have hoped for.

I will not continue this story much longer; I will only sketch the next step, under the assumption that the economy moves to a position above the $b = 0$ locus, e.g. due to rigidity in the wage rate adjustment. Then there are balance of payments deficits, and the money stock is reduced. But this implies that all three loci shift to new positions; the $b = 0$ locus moves upwards, while the other two shift downwards. The monetary adjustment reduces the trade deficits, but in all other respects it worsens the situation. Domestic demand falls, production falls, profits fall, and unemployment rises.

This story shows that it is not obvious that an economy automatically will move towards long run equilibrium, if it for some reason finds itself in a disequilibrium situation initially. In the particular example studied here, the flexibility of w seems to be important. If, in a certain sense, the wage rate moves too slowly, compared to the speed at which firms go out of business, the result may be that a monetary process starts off in the wrong direction, and that the economy moves away from LRSE, rather than towards it.

The brief stability analysis below confirms that the speed of adjustment actually matters. However, before we turn to stability problems, it is worth mentioning that monetary or exchange rate policies may help in the adjustment process, even though we know that m and ϵ have no impact on real values in the final LRSE. From a position as point A in figure 3 we have seen that the economy may get stuck with a constant, but

too low, money stock. A monetary expansion, through active monetary policy, may then be helpful in setting off an adjustment process in the right direction. It is obvious that a monetary expansion alone cannot do the job; a fall in w is still needed in order to reach LRSE. But in contrast to the example above, where the unemployment situation deteriorated when w was reduced, a fall in w combined with an expansion of m may very well improve both employment and profitability. And, as there are unused resources initially, the expansionary policy will have no price effects. It may, however, yield temporary balance of payments deficits, but this again depends on the adjustments of w and n , as well as of m .

Exchange rate policy may also help. A devaluation moves all three loci upwards in the diagram, so the equilibrium value of w in nominal terms is increased. If there is nominal wage rate rigidity, then, an appropriate devaluation can make the fall in w unnecessary, and in this way make the adjustment process easier. If, on the other hand, the wage rate is completely rigid in real terms, neither m nor ϵ can help, since they have no real effects.

4.4.1 Stability.

Rather than performing a complete stability analysis here, I will highlight the one situation in which instability may be a problem, namely the case with rigid, or slow-moving wage rate.

Assume that we have the following dynamic system:

$$\begin{aligned} \dot{w} &= a_1 \cdot z \\ (35) \quad \dot{m} &= a_2 \cdot b \\ \dot{n} &= a_3 \cdot \pi \end{aligned}$$

where a dot indicates time derivative, and the a_i 's are speeds of adjustment¹⁴⁾. We shall use (35) to study two special cases.

Let us first look at a situation where m always adjusts immediately to its (temporary) equilibrium level. Thus, for each change in w or n , m moves to its $b = 0$ level; then w and n change again, etc., until LRSE is reached. Stability of the monetary process is ensured by $b_m < 0$. The remaining system now becomes

$$\dot{w} = a_1 \cdot z^m$$

$$\dot{n} = a_3 \cdot \pi^m$$

where superscript m again indicates the endogeneity of money. We have

$$(36) \quad z^m = \alpha \frac{Y^m}{w} + n\kappa - \bar{l} = 0$$

$$(37) \quad \pi^m = (1-\alpha) \frac{Y^m}{n} - \kappa w = 0.$$

Compared to fig. 1 the slopes of the loci are altered, due to the fact that we now include all accommodating monetary adjustments. It is not difficult to calculate

$$\tilde{y}_w^m = - \frac{\alpha}{1-\alpha} (1 + h - H)$$

and

$$\tilde{y}_n^m = 1 + h - H.$$

14) The system should be written $\dot{w}(t) = a_1 \cdot z(w(t), m(t), n(t))$ etc. where t indicates time; all arguments are suppressed to simplify the notation.

Exchanging these for \tilde{y}_w^m and \tilde{y}_n^m in (27) and (28), we find the slopes of $\pi^m = 0$ and $z^m = 0$. Qualitatively, the only important change is that $\tilde{y}_n^m - 1 > 0$, so $\pi_n^m > 0$, and the π^m locus is positively sloped. As for the z^m locus, its slope is still positive, and given by (28'). The only difference here is that, as $\tilde{y}_w^m < \tilde{y}_w$ (< 0), the locus is less convex than the one with fixed m . The situation is drawn as a phase-diagram in figure 4¹⁵⁾.

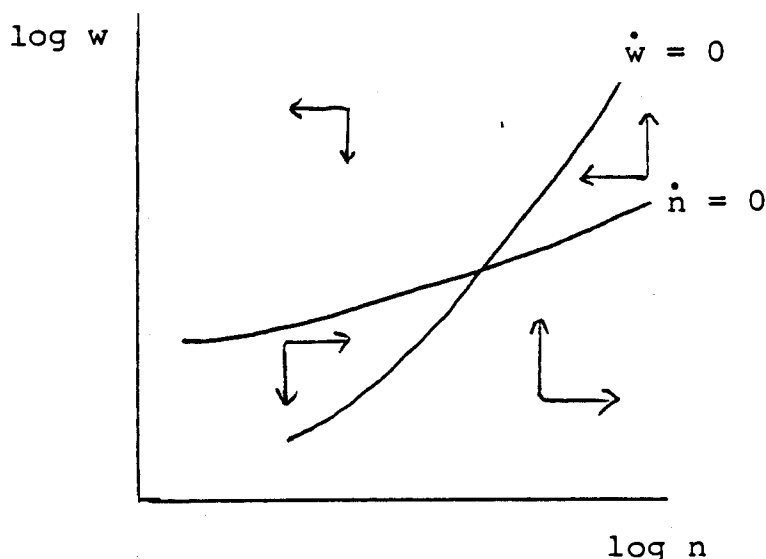


Figure 4

This situation is not stable in general, but it may in certain circumstances be, and the decisive factor is the relative speed of adjustment. If w moves "fast", and in particular if the economy is always on the full employment line, then the equilibrium is stable. If, on the other hand, there is some kind of rigidity in w , the situation may very well be unstable, as can be seen in fig. 4.

The potential instability does not depend on the endogeneity of m in fig. 4. To see this, let us consider w as fixed, and study the remaining dynamic system. Linearized, this may be written

15) $\dot{w} = 0$ ($z^m = 0$) must be steeper than $\dot{n} = 0$ ($\pi^m = 0$) in fig. 4, because $\pi^m = 0$ yields $\frac{y}{w} = \frac{nk}{1-\alpha}$, so moving upwards along the π^m locus implies increases in both y/w and nk . But then employment increases along $\pi^m = 0$, and the $z^m = 0$ locus has to be steeper.

$$\begin{bmatrix} \dot{m} \\ \dot{n} \end{bmatrix} = \begin{bmatrix} a_2 & 0 \\ 0 & a_3 \end{bmatrix} \begin{bmatrix} b_m & b_n \\ \pi_m & \pi_n \end{bmatrix} \begin{bmatrix} m-m^e \\ n-n^e \end{bmatrix}$$

$$\equiv a \ A \begin{bmatrix} m-m^e \\ n-n^e \end{bmatrix}$$

and a necessary stability condition is that the matrix A has positive determinant¹⁶⁾. But

$$\begin{aligned} |A| &= b_m \pi_n - b_n \pi_m \\ &= - (1-\alpha) \frac{Y}{n^2} \left(\frac{1-h}{1-h\sigma} \right) (h-H) \end{aligned}$$

which is negative, since $h > H$. Then the system cannot be stable when w is rigid. This is illustrated in the (m,n) -space in fig. 5.

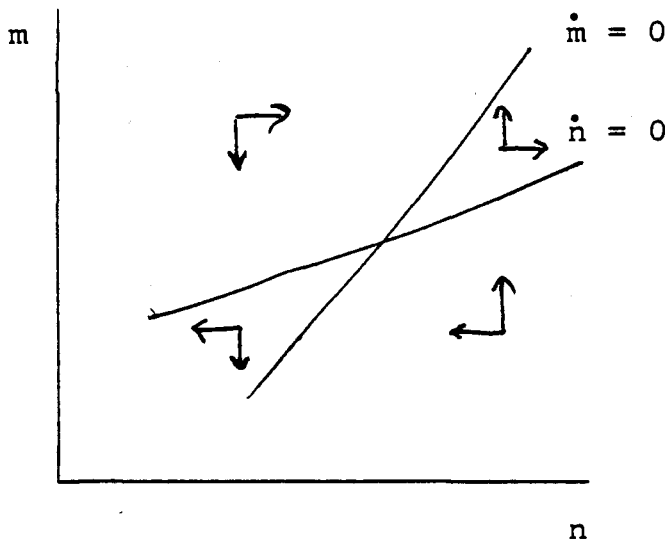


Figure 5

16) See e.g. Gandolfo (1980) or Sydsæter (1981) for stability conditions, both for this special case and for the system (35) in general.

5. FLEXIBLE EXCHANGE RATE

The equilibrium system (20')-(22') is still valid when the exchange rate regime is altered; the choice of endogenous variables is the only thing that changes. With fixed exchange rate it was necessary to let the money stock be determined endogenously in order to ensure external balance in long run equilibrium. When the exchange rate becomes flexible, $b = 0$ will be achieved by endogenous adjustments of ϵ , and endogeneity of m is no longer necessary. Hence, it will now be assumed that the money stock is exogenously given; m may be considered as a policy instrument, and it is possible to analyse effects of monetary policy.

The model becomes very easy to solve in this case. The simplicity follows from the fact that it is assumed that domestic money is the only possible store of value for domestic consumers. Then, since the stock of money is given, equilibrium savings must be given as well, and since savings are equal to $(1-\sigma)y$ and σ is a constant, y must be equal to a simple function of m in equilibrium.

The analysis would be far more complicated if people were allowed to hold foreign assets in addition to domestic money. Then b would consist of the trade balance and a capital account and it would have been necessary to develop a portfolio theory in order to say something about international capital movements (see e.g. Kouri (1976)). Furthermore, "speculative" capital flows may cause problems in floating exchange rate regimes, and such problems are ignored in our approach. However, it must be remembered that we study long run stationary equilibrium, in which all stocks are at their equilibrium levels, and all prices (including ϵ) are expected to remain constant. Hence, allowing for international capital movements would not have had any serious impact on the equilibrium position in our model; it might, however, have had important

implications for stability properties and disequilibrium behaviour.

Rather than performing the same kind of analysis as in section 4 once again, I shall use homogeneity properties to show that in equilibrium m and ε have symmetric effects on all real variables. What matters is m/ε , not m and ε separately, and the choice of exchange rate regime is not important as long as we are studying long run equilibrium situations.

The relevant demand side properties are condensed in (13), which may be written $y = f(p_h, m, \varepsilon P_f, \varepsilon Y; \sigma)$. $f(\cdot)$ is linearly homogeneous (in all variables, except σ), which implies that

$$(38) \quad \frac{Y}{\varepsilon} = f\left(\frac{p_h}{\varepsilon}, \frac{m}{\varepsilon}, P_f, Y; \sigma\right).$$

The money market equilibrium condition (21') yields

$$(39) \quad \frac{Y}{\varepsilon} = \frac{1}{1-\sigma} \frac{m}{\varepsilon}.$$

Together, (38) and (39) become

$$f\left(\frac{p_h}{\varepsilon}, \frac{m}{\varepsilon}, P_f, Y; \sigma\right) = \frac{1}{1-\sigma} \frac{m}{\varepsilon}$$

which by the Implicit Function Theorem implies that we may write

$$\left(\frac{p_h}{\varepsilon}\right)^d = g\left(\frac{m}{\varepsilon}, P_f, Y; \sigma\right)$$

where superscript d indicates that this function comes from the demand side of the economy. The equation gives combinations of p_h and m (both measured in foreign currency) consistent with equilibrium in the money market, when this is viewed from the demand side only.

From the supply side of the market we have

$$p_h = n^{-\frac{1-\alpha}{\alpha}} \frac{\mu}{\alpha} w.$$

n is given in (29), while w can be found from (30); these expressions were calculated from the $z = 0$ and the $\pi = 0$ condition, and they must be valid irrespective of the choice of exchange rate regime. Then

$$p_h = \left[\frac{\bar{\lambda}}{\kappa} (1-\alpha) \right]^{-\frac{1-\alpha}{\alpha}} \frac{\mu}{\alpha} \frac{Y}{\bar{\lambda}}$$

$$\equiv k(\bar{\lambda}, \kappa, \mu) Y.$$

Applying again the money market equilibrium condition, we get

$$\left(\frac{p_h}{\varepsilon} \right)^s = k(\bar{\lambda}, \kappa, \mu) \left(\frac{1}{1-\sigma} \right) \frac{m}{\varepsilon}.$$

In equilibrium we must have $(p_h/\varepsilon)^d = (p_h/\varepsilon)^s$, i.e.

$$(40) \quad g\left(\frac{m}{\varepsilon}, P_f, Y; \sigma\right) = k(\bar{\lambda}, \kappa, \mu) \left(\frac{1}{1-\sigma} \right) \frac{m}{\varepsilon},$$

which determines the LRSE value, $(m/\varepsilon)^e$, as a function of all the exogenously given variables. When (40) is satisfied, there will be full long run equilibrium, since the full employment and the zero profit conditions are already built into the supply side expression. It doesn't matter whether m or ε is the endogenous variable in (40); the important point is that the endogenously determined (m/ε) satisfies the equation. Existence and uniqueness of LRSE have been proved in the fixed rate regime; (40) shows that the proof applies equally well with flexible exchange rate, and we know for sure that it is actually possible to find a positive value of (m/ε) so that (40) is satisfied.

Nominal variables, like y and w , depend on the nominal level of m and ϵ (and, of course, on the exogenous variables). When it comes to real income and real wage rate, it is, however, easy to see that m/ϵ is what matters. We have

$$\frac{Y}{P} = \frac{y/\epsilon}{p/\epsilon}$$
$$= \frac{f(p_h/\epsilon, m/\epsilon, P_f, Y; \sigma)}{\phi(p_h/\epsilon, P_f)}$$

$$(41) \quad \equiv \phi(P_f, Y, \frac{m}{\epsilon}, \sigma)$$

and $\frac{w}{P} = \frac{1}{\bar{L}} \frac{Y}{P}$. Thus, all the results we established in the fixed exchange rate case, are applicable with floating rate, as well, as long as we restrict our interest to real variables. Substituting $(m/\epsilon)^e$ for m/ϵ in (41), we actually get real income as a function of all the exogenously given variables.

In disequilibrium situations the choice of exchange rate regime may be important, especially if, for some reason, the adjustment process towards equilibrium works better in one of the regimes than in the other. But, as mentioned in the beginning of this section, the model is not suitable for analysis of such problems. In particular, when it comes to exchange rate dynamics, there isn't very much interesting to say in a model without international capital mobility. More generally, we haven't said anything about dynamics so far, and in order to discuss disequilibrium situations and compare adjustment processes in different regimes, we would need a theory of the dynamics of all the endogenous variables, not only the exchange rate.

6. CONCLUDING REMARKS

In this paper we have studied stationary equilibrium situations in a small, open economy. The special feature of the model is that there is monopolistic competition in the production sector; commodities are heterogeneous, and each firm produces its own variety, for which there is a downward sloping demand-curve. The number of different varieties, i.e. the number of firms, is determined endogenously in the model, and the criterion is that the marginal firm earns non-positive profits. To make this criterion operational, it has been necessary to work with specific demand- and cost-functions. This makes it difficult to draw any general conclusions from the analysis; it is probably more correct to regard the results as examples of possible outcomes. It is not easy to assess to which extent the results will be valid in alternative settings, but the results are nevertheless of interest.

The purpose of the paper was twofold: Firstly to spell out properly the microeconomic foundation of a simple one-sector model of a small, open economy, trading in a world in which different commodities are imperfect substitutes for each other; and secondly to establish comparative statics and other properties of this model.

The consumers' optimization process resulted in the national income expression specified in (13). It shows the domestic income (in nominal terms), as this can be calculated from the demand side of the economy. It is a simple multiplier expression, where demand from abroad and the exogenous part of domestic demand determine the level of the national income.¹⁷⁾ The propensity to import is a function of the terms of trade;

17) The money stock constitutes exogenous domestic demand, since all the money is held by the old generation, and thus has to be spent during the present period. In the long run m is endogenous, and the national income expression is altered accordingly (see equation (31)).

hence, the same is true for the multiplier. Similar expressions can be found in more ad hoc type macroeconomic models, see e.g. Dornbusch (1980). On the other hand, micro-based models of small, open economies trading in perfectly competitive markets yield different results. In such models there is complete separability between the demand- and the supply-side domestically, and national income is determined from the supply-side alone, as the maximum revenue obtainable, given world prices and domestic factor endowments.

In my model the producers determine prices so as to maximize profits, given the perceived demand functions (the dd -curves). The free entry or exit of firms ensures that actual and perceived demand is the same in equilibrium. But then it is obviously impossible to separate the demand and the supply side, since the demand schedules are of direct importance in the suppliers' decision process.

It may be worth mentioning that if a perfectly competitive sector is added in the model, the resulting equilibrium situation will probably be similar to what one obtains in two-sector models with traded and non-traded goods. The one sector may take prices as parameters, while for the other one the demand conditions are important. However, there will also be differences: In my model the demand conditions are assessed by every firm; in a standard two-sector model the producers all behave atomistically. Furthermore, in my model both domestic and foreign demand count, whereas for non-traded goods there is by definition no foreign demand. These differences may possibly be of importance; this is however the theme for future work with the model.

As to results of the analysis, one important aspect is the way in which the small economy depends on the development in the rest of the world. We have seen that although foreign prices and income enter the specification in seemingly different manners, they actually have symmetric (inverse) effects on the domestic situation, in real terms. Thus, what matters is the

real income abroad, and not income and price-level separately. This again is in contrast to models with perfect substitutability, where the only important international factor is the price-level the small economy faces.

The magnitude of the equilibrium reaction to a foreign real income shock is also interesting. The real income change at home is less than proportional to the international shock, so if there is a recession internationally, our small open economy need not be as severely hit as the rest of the world. On the other hand, real growth abroad doesn't automatically yield the same improvement in the small country.

Finally, money and exchange rate have no real, long run effects, so one may say that classical dichotomy is confirmed in this model. This does, however, not mean that the choice of monetary or exchange rate policy is immaterial. It may very well be important for the way the economy behaves in disequilibrium or temporary equilibrium situations, and for the adjustment process towards long run equilibrium. What the dichotomy implies then, is that in choosing e.g. between fixed and floating exchange rate, emphasis should be on the impact on the adjustment process, stability etc., and not on the final long run equilibrium situation.

So far nothing has been said about the propensity to spend (σ), except that it has to be between 0 and 1. A shift in σ may come about if consumption or income profiles are altered. It is, however, easy to see that such a shift works exactly like a change in the money stock; hence there are no long run effects. This follows directly from the endogeneity of money. But unless the money stock always adjusts immediately to its equilibrium level, there may be short run effects of a change σ . The disequilibrium situation studied in section 4.4 could for instance have appeared due to a sudden increase in the propensity to save, and from the discussion in that section, we know that such a situation may be difficult to handle; the shift in the saving propensity obviously has real effects in the short run in that case.

REFERENCES

- Dixit, A. (1978): "The Balance of Trade in a Model of Temporary Equilibrium with Rationing." Review of Economic Studies, 45, 393-404.
- Dixit, A. and Norman, V. (1980): Theory of International Trade. Cambridge University Press, Cambridge.
- Dixit, A. and Stiglitz, J. (1977): "Monopolistic Competition and Optimal Product Diversity." American Economic Review, 297-308.
- Dornbusch, R. (1980): Open Economy Macroeconomics. Basic Books, Inc., New York.
- Frenkel, J.A. and Johnson H.G. (1976): The Monetary Approach to the Balance of Payments. Allen & Unwin, London.
- Gandolfo, G. (1980): Economic Dynamics: Methods and Models. North Holland, Amsterdam.
- Haaland, J.I. (1982): Temporær likevekt og monopolistisk konkurranse i en liten åpen økonomi. Unpublished manuscript, NHH, Bergen.
- Hahn, F.H. (1977): "The Monetary Approach to the Balance of Payments." Journal of International Economics, 7, 231-249.
- Hahn, F.H. (1982): Money and Inflation. Basil Blackwell, Oxford.
- Kouri, P. (1976): "The Exchange Rate and the Balance of Payments in the Short Run and in the Long Run: A Monetary Approach." Scandinavian Journal of Economics, 78.

Krugman, P. (1982): "Trade in Differentiated Products and the Political Economy of Trade Liberalization." In Bhagwati, J.N. (ed): Import Competition and Response. The University of Chicago Press, Chicago.

Neary, J.P. (1980): "Non-traded Goods and the Balance of Trade in a Neo-Keynesian Temporary Equilibrium." Quarterly Journal of Economics.

Spence, M. (1976): "Product Selection, Fixed Costs and Monopolistic Competition." Review of Economic Studies, 217-235.

Sydsæter, K. (1981): Topics in Mathematical Analysis for Economists. Academic Press, London.

GROWTH AND THE TERMS OF TRADE
WITH MONOPOLISTIC COMPETITION

GROWTH AND THE TERMS OF TRADE
WITH MONOPOLISTIC COMPETITION

INTRODUCTION

Recently the theory of intra-industry trade has advanced markedly through the introduction of scale economies, differentiated products and imperfect competition in models of international trade (see e.g. Krugman (1979, 1980), and Dixit and Norman (1980); for a survey-article see Helpman (1984)). These models typically explain inter-industry trade by means of comparative advantage arguments, while trade in similar products - intra-industry trade - occurs due to either economies of scale, demand for diversity, or both.

In this paper I will analyse how the terms of trade are determined for an economy trading in a world in which intra-industry trade has a dominating position. In the first part of the paper I will look at a one-sector economy; the world market situation for this sector is one of monopolistic competition, and international trade takes place only because commodities are heterogeneous and diversity is assessed as positive. A similar one-sector model is analysed in Krugman (1979), but in his model the terms of trade are identically equal to unity. This is so because the two economies in his model are completely symmetric, in the sense that the demand and production conditions facing each firm are identical, regardless of where the firm is located. Hence all firms charge the same price and produce the same quantity, and there is no room for variation in the equilibrium terms of trade. The countries may differ in size; such a difference yields a proportional difference in the number of firms, but each firm still produces at the same scale and charges the same price as all the others.

The present model allows, in contrast, some asymmetry between the economies, and then it need no longer be the case that prices are identical. It is a model of a small, open economy,

and the formulations both of smallness and openness turn out to be important for the terms of trade results. We are used to thinking of a small country assumption as synonymous with perfectly elastic demand curves and exogenously given prices, but with differentiated products there may be downwards sloping demand curves for all product-varieties, and even for a small country prices and the terms of trade are determined endogenously. Smallness in this framework is taken to imply that the country is negligible in the aggregate sense that whatever happens in this economy it has no effect on macroeconomic conditions abroad. A change in export prices does of course affect the demand for our exports, and this effect may be crucial for the home country, but from the foreigners' point of view the shift is negligible.

As for openness, it is common in the literature on intra-industry trade to assume that all varieties are available to all the consumers. This assumption, together with the often made assumptions that the consumers have identical preferences and that the differentiated commodities enter the utility-function symmetrically, implies that at equal prices demand will be the same for all varieties, and hence, that each consumer allocates his budget between, say, home-produced and imported commodities in proportion to the relative number of varieties in the two categories. For a small country this implies that not only are its products of negligible importance to the foreigners, but the same must also be true for the domestic consumers. Hence, a consumer in a small economy spends almost his entire income on imported commodities, and next to nothing on domestically produced varieties. This does not seem to be in accordance with what one could expect, based on some casual empirical observations; even in small countries home-produced commodities seem to be of some importance in the domestic consumers' commodity bundle, and it is not unrealistic to expect the budget-share going to these products to be higher at home than in the rest of the world.

If we want to incorporate such ideas in the model it is necessary to alter one or more of the three assumptions mentioned above. One could for instance assume that people have special preferences for home-produced commodities; this would, however, be unsatisfactory, for at least two reasons. First, it would be difficult to relate the results to similar results in standard trade theory, since this theory usually assumes identical preferences. And second, the definition of an industry might be ambiguous if there were systematic differences in substitutability for various groups of commodities; it might be difficult to know whether we in fact studied inter- or intra-industry trade.

To avoid these problems, I will retain the assumptions of identical and symmetric preferences but alter the one about relative openness of the economies. Specifically, I will assume that the small country is completely open, in the sense that all domestically produced varieties are sold internationally, but this is not the case for the large country. As far as trade vis-à-vis our small country is concerned, a number of the foreign produced commodities can be considered as non-traded. Or, to put it another way, in a world trading in a large number of differentiated products, not all varieties will be available to the consumers in our small country. Some goods will be produced and consumed in the rest of the world without ever being exported to the small country in question.

With these assumptions of relative size and openness, prices for domestic and foreign commodities need no longer be identical, and it becomes interesting to analyse how the terms of trade are determined for such an economy. Special emphasis will be put on the relationship between the terms of trade and growth in the domestic factor supply, as this is a case that is often analysed in standard trade theory, but I will also look at some other variables that may be of importance.

Having done this for the simple one-sector economy, I will in the last part of the paper extend the model by introducing a

second sector - a perfectly competitive one - in the economy, and see how this modifies the results. However, contrary to the two-sector models mentioned above (e.g. the one in Dixit and Norman (1980)), the purpose is not to explain the intersectoral trade. In a way I take the trade structure as given, and concentrate on the determination of relative prices in the imperfectly competitive industry. The competitive sector may, nevertheless, be important, both because it generates income, and because the set of commodities to choose from is extended.

A ONE - SECTOR MODEL

There are two countries in the model; the (small) home country, and one country representing the rest of the world. Variables related to the home country (prices, quantities, etc.) are given by small letters, while the same variables for the rest of the world are given by capital letters. We are primarily interested in the situation in the home country; hence, for the rest of the world we only model those features that are of importance for the equilibrium in the home country.

It is a static general equilibrium model. There is no money in the model, and prices are identical in the two countries.

DEMAND

There is one (representative) domestic consumer. He consumes a number of differentiated commodities. All commodities are imperfect substitutes, and in principle demand for each variety will be a function of its own and all other prices. However, to make the analysis manageable, and especially to make it possible to study effects of changes in the number of different varieties, it is necessary to work with a less gene-

ral specification. Actually, it will be assumed that all commodities enter the utility function in a symmetric way, i.e. in such a way that if two products have the same price, the demand will also be the same. This can be achieved by having a utility function of the form $u = f(\sum v(c_i))$. If $v(\cdot)$ is concave, such a specification ensures that diversity is assessed as positive by the consumer.

To prepare the ground for the analysis of the two-sector economy below, I will go one step further and apply a CES-specification of the utility function. This facilitates the analysis, but the results could equally well be obtained with the slightly more general specification mentioned above.

To be specific, there are n different home-produced goods (h-goods) and m foreign-produced ones (f-goods) available to the domestic consumer. His demand is determined by

$$\max_{c_i} u = \left[\sum_{i=1}^{n+m} c_i^\alpha \right]^{\frac{1}{\alpha}} \quad 0 < \alpha < 1,$$

(1)

$$\text{s.t.} \quad \sum_{i=1}^{n+m} p_i c_i \leq y$$

where c_i and p_i are quantity and price of commodity i , and y is income. The elasticity of substitution between any pair of commodities is $1/(1-\alpha)$. To the consumer it makes no difference whether the goods in question are home-produced or imported, but it is nevertheless analytically convenient to make a distinction between h- and f-goods, not the least because we are going to focus on terms of trade effects. To highlight such effects, let us assume that all h-goods have the same price, p_h , and equivalently p_f for f-goods. Then the terms of trade, ρ , are given as $\rho = p_h/p_f$.

Define the price-index

$$q_h = \left[\sum_{i=1}^n p_i^{\frac{\alpha}{1-\alpha}} \right]^{\frac{1-\alpha}{\alpha}}$$

With identical prices this becomes

$$(2) \quad q_h = n^{\frac{1-\alpha}{\alpha}} \cdot p_h$$

and, equivalently

$$(3) \quad q_f = m^{\frac{1-\alpha}{\alpha}} \cdot p_f$$

It is not difficult to show that the share of total income that will be spent on h-goods is a function of $q \equiv q_h/q_f$. If c_h is the demand for each individual h-good (the same for all), we have in optimum

$$(4) \quad np_h c_h = h(q) y$$

and

$$(5) \quad mp_f c_f = [1-h(q)] y.$$

Using (2) and (3) we get

$$(6) \quad q = \left(\frac{n}{m} \right)^{\frac{1-\alpha}{\alpha}} \cdot \rho.$$

Hence, the income-share spent on home-produced goods is a function of the terms of trade and of the relative number of h-goods to f-goods. The exact form of $h(q)$ is

$$(7) \quad h(q) = \left(1 + q^{\frac{\alpha}{1-\alpha}} \right)^{-1},$$

and the elasticity of h w.r.t q , denoted \tilde{h} , is

$$(8) \quad \tilde{h} = - \frac{\alpha}{1-\alpha} (1 - h(q)).$$

Demand from abroad is established analogously. There is one representative consumer with an optimisation problem similar to the one in (1). Letting capital letters denote foreign equivalents of all the domestic variables defined above, aggregate demand for our exports in money terms (in foreign currency) may be written¹⁾

$$(9) \quad NP_h C_h = H(Q) Y.$$

SUPPLY

The number of domestic producers, n , is taken to be so large that each firm safely can assume that it has a negligible influence on the price level, q_h , and on the aggregate supply of h -goods. Nevertheless, due to the heterogeneity of products, each firm faces a downward-sloping demand curve on each market (domestically and abroad), and it cannot take the price as given. In a Chamberlinian way, we shall assume that each firm adjusts optimally to its 'dd-curve' on each market, i.e. the perceived demand curve given that all other prices are unchanged. Our first task, then, is to determine the optimal price for a representative producer.

Under the assumption of negligible influence on aggregates, it is easy to calculate from (1) that the 'dd-elasticity' of demand on the domestic market is $-1/(1-\alpha)$. (It is the same for all commodities, due to the symmetry in (1).) To simplify we

1) The subscripts h and f represent the same commodities as above; hence from the foreign consumer's point of view the h -goods are the imported ones, etc. Also, $H(Q)$ is the foreigners' budget-share spent on h -goods, not on their own home-produced commodities.

shall assume that the parameter α is the same for the foreign consumer; hence the 'dd-elasticity' abroad is also $-1/(1-\alpha)$. Then as far as pricing is concerned, the two markets may be considered as one, in which the 'dd-curve' may be written

$$x_i = \xi p_i^{-\frac{1}{1-\alpha}}$$

In equilibrium we must have $x_i = c_i + C_i$. The inverse demand function facing firm i is

$$(10) \quad p_i = \gamma x_i^{\alpha-1}.$$

Labour is the only (variable) input in the production. The production function $x_i = f(l_i)$ shows increasing returns to scale; it will be assumed to have a particularly simple form, which, in terms of labour-requirement, may be written

$$(11) \quad l(x_i) = \mu \cdot x_i + \kappa.$$

Hence, if the wage rate is w , there is a fixed (but non-sunk) cost, $w\kappa$, and a constant marginal cost, $w\mu$. Profit is given by

$$(12) \quad \pi^i = p_i x_i - w l(x_i)$$

Maximizing π^i subject to (10) and (11) yields

$$(13) \quad p_i = \frac{1}{\alpha} \mu w.$$

Thus the optimal price will be a fixed markup over marginal costs.²⁾

2) It is clear from (13) that as long as α is the same at home and abroad, the optimal price will be the same as well. With different α 's price-discrimination would be optimal; this would, however, not have had any serious implications for our analysis.

In the specification of the demand side, we assumed that all h-goods were sold at the same price. Now we see that this amounts to assuming that all domestic firms have identical cost functions; then we have $p_h = \frac{1}{\alpha} \mu w$ for all home-produced commodities.

What about quantities? As there is free entry, we know from traditional Chamberlinian analysis that the equilibrium quantity must be given by the tangency between the 'dd-curve' and the average cost curve. At such a point all firms earn zero profits³⁾, and there are no incentives to enter or leave the industry. Then in full equilibrium we must have

$$\pi^h = p_h x_h - w(\mu x_h + \kappa) = 0$$

or, using (13)

$$(14) \quad x_h = \frac{\alpha}{1-\alpha} \frac{\kappa}{\mu}$$

Hence, the equilibrium supply by our representative firm is a simple function of the parameters in the cost function.

Using (11) and (14) the representative firm's demand for labour becomes

$$(15) \quad l_h = \frac{\kappa}{1-\alpha} .$$

3) It is assumed that $n \in R_+$. If n is restricted to be an integer, the free entry condition would be $\pi(n) \geq 0$, $\pi(n+1) < 0$.

SMALLNESS AND OPENNESS

The economy is small in the sense that it cannot influence macroeconomic conditions abroad. Foreign income, Y , and also cost and employment condition abroad are taken to be exogenously given. But then, assuming a pricing procedure abroad similar to the one discussed for h-goods, we may consider P_f as exogenously given, as well.

As for openness, the following will be assumed: The small country is completely open, i.e. all h-goods are traded internationally, and $n = N$. The foreign country (the rest of the world), on the other hand, is less open, as far as trade vis-à-vis our small country is concerned. Thus from the total number of foreign-produced commodities (M) only a small subset is exported to the country in question, implying that $m \ll M$.

This assumption seems to be in accordance with the stylized fact that small countries are relatively more open than large ones. The assumption makes even more sense if we interpret the large country as the rest of the world. Then it says that in a world consisting of a large number of countries trading in differentiated products, not all varieties will be sold in every small country. Even if all the economies are completely open, one would expect a substantial number of commodities to be traded between third countries, without ever being available for the consumer in our home-country.

A third way of looking at the question of openness is as an assumption of (potential) non-traded goods in all countries. What matters in our context is that $n/m > N/M$, and this is achieved when $n \geq N$ and $M > m$, i.e. when there are non-traded goods in both countries. However, the essential features come through even with $n = N$, and this simplifies the analysis.

This assumption of relative openness has important implications for the demand-functions specified in (4) and (9).

From (6) it is easy to see that the smaller n/m is, the bigger is q . But then $Q > q$, and subsequently $H(Q) < h(q)$. Furthermore, using (7) we see that

$$H(Q) = \left(1 + \frac{M}{N} \rho^{\frac{\alpha}{1-\alpha}} \right)^{-1}$$

so if M/N is 'high', we may consider H as being close to 0. This implies that h -goods are relatively unimportant, in terms of budget share, in the consumption bundle for the foreign consumer. It does, however, not imply that exports necessarily are less important than domestic sales for the representative domestic firm. Remember that export-value relative to the value of home-market sales is HY/hy ; we know that $H < h$ and $Y > y$, but we don't know the relationship between HY and hy .

EQUILIBRIUM AND THE TERMS OF TRADE

If z^l denotes the excess demand for labour, and z^h is excess demand for each variety of h -goods (it is the same for all, due to the assumed symmetry), then equilibrium is given by

$$(16) \quad z^l = 0$$

$$(17) \quad z^h = 0.$$

These conditions determine the endogenous variables n and p_h (or rather w , but as $p_h/w = \mu/\alpha$, which is given, we may as well study p_h -effects directly).

Labour supply is fixed at \bar{l} . Labour demand for a representative firm was calculated in (15). Then

$$\begin{aligned} z^l &= n \lambda_h - \bar{l} \\ &= \frac{n \kappa}{1-\alpha} - \bar{l}. \end{aligned}$$

The wage rate does not enter this expression; hence n is determined from (16) alone. We get

$$(18) \quad n = (1-\alpha) \frac{\bar{l}}{\kappa},$$

i.e. the equilibrium number of firms is proportional to the size of the labour force. It decreases with a rise in real fixed costs, as one would expect.

We then have one equation and one unknown, p_h . We have

$$\begin{aligned} z^h &= c_h + C_h - x_h \\ &= \frac{1}{np_h} h(q) y + \frac{1}{np_h} H(Q) Y - x_h. \end{aligned}$$

The domestic income, y , is equal to the value of domestic production. From the supply side we then have

$$(19) \quad y = n p_h x_h.$$

Remembering that x_h and n are independent of p_h , or the terms of trade $\rho = p_h/p_f$ (see (14) and (18)), and that q and Q are function of ρ and the number of firms, we may write

$$(17') \quad z^h = h\left(q\left(\frac{n}{m}, \rho\right)\right) \cdot x_h + \frac{1}{n\rho} H\left(Q\left(\frac{n}{M}, \rho\right)\right) \cdot \frac{Y}{P_f} - x_h = 0.$$

To simplify the notation, let us use $R \equiv Y/P_f$. Then the equilibrium terms of trade are

$$(20) \quad \rho = \rho(n, x_h, R, m, M)$$

Using (17') it is easy to establish the partial effects in (20). If $\tilde{\rho}_i$ is the partial elasticity of ρ with regard to variable i , we get

$$\tilde{\rho}_n = \frac{1-\alpha}{\alpha} \frac{h - H}{1/\alpha + h - H} > 0$$

$$\tilde{\rho}_x = - \frac{1-\alpha}{\alpha} \frac{1}{1/\alpha + h - H} < 0$$

$$(21) \quad \tilde{\rho}_R = \frac{1-\alpha}{\alpha} \frac{1}{1/\alpha + h - H} > 0$$

$$\tilde{\rho}_m = - \frac{1-\alpha}{\alpha} \frac{h}{1/\alpha + h - H} < 0$$

$$\tilde{\rho}_M = - \frac{1-\alpha}{\alpha} \frac{1 - H}{1/\alpha + h - H} < 0$$

The only surprising effect here is that ρ depends positively on n , i.e. that an increase in the number of firms, and thus in the total domestic supply, yields an improvement in the terms of trade, rather than a deterioration. Normally one would expect that a rise in n yields excess supply of h -goods, and hence that a fall in the terms of trade is necessary to restore equilibrium. With differentiated products the rise in n does not only raise aggregate supply, it also increases diversity of h -goods, and as this is assessed as positive by the consumers, the aggregate demand for home produced commodities increases. Normally, at least in partial equilibrium models of monopolistic competition, one assumes that the rise in demand is smaller than the rise in supply, so that excess demand for each variety decreases. However, in the general equilibrium model studied here, there are income effects as well, and since the monopolistically competitive industry covers the whole economy, the income effects become particularly strong. If we look at (17') we see that, at given prices, an increase in n raises the average domestic demand for h -goods via the positive shift in the budget share, $h(q)$. There are two additional effect on the home market; a negative shift in average demand due to the change in $1/n\rho_h$, and a positive income effect. However, these two effects net out, as we see in (17').

On the foreign market there is no income effect, and the average demand for h-goods falls. But the fall is less than proportional to the shift in n , since the budget share $H(Q)$ increases. The expression for $\tilde{\rho}_n$ in (21) shows that the positive shift in the domestic demand dominates, as we know that $h > H$.

Then, for the comparative static analysis there are three important equations, which I rewrite here

$$(14) \quad x_h = \frac{\alpha}{1-\alpha} \frac{\kappa}{\mu}$$

$$(18) \quad n = (1-\alpha) \frac{\bar{\lambda}}{\kappa}$$

$$(20) \quad \rho = \rho(n, x_h, R, m, M)$$

$\begin{matrix} + & - & + & - & - \\ \text{---} & \text{---} & \text{---} & \text{---} & \text{---} \end{matrix}$

Domestic growth, $d\bar{\lambda} > 0$, yields a proportional increase in the number of firms, while the production in each firm remains unchanged. Then (20) shows that growth will be accompanied by a terms of trade improvement in this model. The discussion of an n -change above applies directly; the important point here is that the entire increase in supply comes as new varieties, rather than as larger quantities of the old ones. It is worth noting that the terms of trade effect of domestic growth in this model is the opposite of what one usually gets in models with perfect competition. In such models there is actually a possibility of immiserizing growth, due to terms of trade deterioration following the increase in domestic supply.

A balanced change in productivity, i.e. $d\kappa/\kappa = d\mu/\mu$, has exactly the same effect as a shift in $\bar{\lambda}$. x_h is unchanged, n increases with a rise in productivity ($d\kappa < 0$), and the terms of trade improve.

A fall in the marginal costs, μ , leaving κ unchanged, yields increased supply ($dx_n > 0$), unaltered diversity, and terms of trade deterioration. On the other hand, a fall in the fixed costs, i.e. $dk < 0$, $d\mu = 0$, implies increased diversity, decreased supply by each firm, and terms of trade improvement.

Finally, the effects of foreign growth can be analysed. If we associate such growth with an increase in the foreign real income, R , and if this is the only thing that happens, then (20) shows that our terms of trade improve. However, in the discussion of domestic growth an important feature (indeed, the most important one) was that the number of firms and varieties increased. If the equilibrium conditions are similar abroad, we should expect M (and possibly m) to vary with R , and in (20) we see that this tends to worsen the terms of trade. To conclude anything about the total effect, we have to assume something about the magnitude of the change in numbers relative to the real income change. We shall look at two special cases:

(i) If $dM/M = dR/R > 0$ and $dm = 0$, then we can use (21) to establish that the total effect on ρ is

$$\tilde{\rho}_R + \tilde{\rho}_M = \frac{1-\alpha}{\alpha} \frac{H}{1/\alpha + h - H} > 0.$$

Hence, terms of trade still increase, but as H is assumed to be very small, the effect is negligible.

(ii) If in addition there is a proportional increase in the number of commodities exported to our country, then the terms of trade effect becomes⁴⁾

$$\tilde{\rho}_R + \tilde{\rho}_M + \tilde{\rho}_m = - \frac{1-\alpha}{\alpha} \frac{h - H}{1/\alpha + h - H} < 0.$$

4) Note that this effect is equal to $-\tilde{\rho}_n$. Hence, in this case foreign and domestic growth work symmetrically, and homogeneity of the ρ -function is ensured.

This shows that the effect of foreign growth depends critically on the assumptions we make regarding the changes in the numbers of varieties on the two markets. It seems natural to assume that the total number of firms producing f-goods increases when the foreign labour force grows. It is not so obvious that the number of varieties being imported to our home-country is raised proportionally. In the discussion on relative openness it was somewhat arbitrarily argued that it is reasonable to have $m \ll M$, but nothing was said about how m is determined. If there is a zero-profit condition this will typically determine M , but not m , and without knowing how m is determined, it is impossible to say how it reacts to a change in the size of the labour force. A tentative conclusion, then, may be that foreign growth yields an increase in aggregate demand abroad, and this tends to increase demand for h-goods. However, if there is an associated increase in the diversity of f-goods, the consumers tend to spend more on f-goods and less on h-goods; this reduces the initial positive effect and it may outweigh it completely.

Welfare effects are easy to trace. We have

$$u = (n c_h^\alpha + m c_f^\alpha)^{\frac{1}{\alpha}}.$$

Hence

$$\frac{du}{u} = \frac{nc_h^\alpha}{nc_h^\alpha + mc_f^\alpha} \left(\frac{dc_h}{c_h} + \frac{1}{\alpha} \frac{dn}{n} \right) + \frac{mc_f^\alpha}{nc_h^\alpha + mc_f^\alpha} \left(\frac{dc_f}{c_f} + \frac{1}{\alpha} \frac{dm}{m} \right).$$

Trade is balanced, so $mp_f c_f = np_h c_h$, and

$$\frac{dc_f}{c_f} = \frac{dn}{n} - \frac{dm}{m} + \frac{dp}{p} + \frac{dc_h}{c_h}.$$

Further, $C_h = x_h - c_h$, and $c_h/x_h = h$, which implies that

$$\frac{dC_h}{C_h} = \frac{1}{1-h} \frac{dx_h}{x_h} - \frac{h}{1-h} \frac{dc_h}{c_h}.$$

Finally, $nc_h^\alpha / (nc_h^\alpha + mc_f^\alpha) = h$, and we get

$$(22) \quad \frac{du}{u} = \frac{dx_h}{x_h} + (1-h) \frac{d\rho}{\rho} + (1-h + \frac{h}{\alpha}) \frac{dn}{n} + (1-h) \frac{1-\alpha}{\alpha} \frac{dm}{m}$$

Using this and the terms of trade effects discussed above, it is easy to establish comparative static welfare effects.

A change in n , e.g. due to domestic growth, has a positive direct effect and a positive indirect effect via ρ . Then welfare inevitably improves, and it is easy to see that the relative change is bigger than the shift in n .

An increase in x_h has a positive direct effect, but the terms of trade deteriorates. Using (21) it can be established that the direct effect dominates. The same is true for a change in m , the number of imported commodities. Hence if one tries to restrict imports, there is a positive terms of trade effect, but welfare inevitably deteriorates. This also shows that foreign growth improves our welfare, even if the change in diversity is such that the terms of trade deteriorate.

A TWO - SECTOR MODEL.

The most striking result in the analysis above is probably the positive terms of trade effect of domestic growth. This relationship seems to stem from, essentially, two features in the model. First, the fact that labour demand turned out to be independent of the wage rate; hence the number of firms was given from the full employment condition alone (plus the zero profit requirement), and the equilibrium n became proportional to the labour stock (see (18)). Second, domestic income was equal to the value of the production in the monopolistically competitive (MC) industry, since this was the only sector in the economy. Hence changes in n or p_h were accompanied by strong income effects.

In this section I will introduce a perfectly competitive (PC) sector in the economy. Then both of these special features are modified, and it is interesting to see whether the results still hold true. I will focus on the effects of domestic growth, but some other comparative static effects will also be shown.

The perfectly competitive sector produces one (aggregate) commodity, labelled 0. The world market price is P_0 , and due to our small country assumption no domestic actions have any influence on P_0 . With fixed exchange rate, the domestic currency price, p_0 , may then be considered as exogenously given. Production takes place in one (representative) firm, in which a quantity x_0 is produced with labour as the only (variable) input in the production. There are decreasing returns to scale⁵⁾, and optimum production can be represented by the profit function $\pi^0(p_0, w)$. We know that

5) It may, at first glance, seem more appropriate to have a constant return industry. However, with only one input we would then either get complete specialisation or indeterminate scale of production.

$$(23) \quad \begin{aligned} x_0 &= \pi_p^0(p_0, w) \\ \lambda_0 &= - \pi_w^0(p_0, w) \end{aligned}$$

and that $\pi^0(\cdot)$ is linearly homogenous.

Having in a fundamental way altered the range of commodities to choose from, we must also modify the utility function in (1). Following Dixit and Norman (1980), Horn (1983) and others, we shall use a simple Cobb Douglas specification

$$(24) \quad u = c_0^{1-\beta} \left(\sum_{i=1}^{n+m} c_i^\alpha \right)^{\frac{\beta}{\alpha}}$$

Maximizing u subject to an ordinary budget constraint yields

$$(25) \quad \begin{aligned} p_0 c_0 &= (1-\beta) y \\ \sum_{i=1}^{n+m} p_i c_i &= \beta y. \end{aligned}$$

The optimal choices within the group of commodities from the MC-sector, will be the same as in the one-sector model, only exchanging βy for y throughout. Hence, still assuming symmetry we have e.g.

$$c_h = \frac{1}{n p_h} h(q) \beta y.$$

In applying a Cobb Douglas specification we abstain from some possibly interesting substitution effects between the sectors. On the other hand we gain much simplicity, and it seems worthwhile to do it like this. A more general specification would be to let u be homothetic, but not necessarily Cobb Douglas. Then β would be a function of p_0 relative to a price index for

the MC-commodities⁶⁾, and the elasticity of substitution could be different from unity. Towards the end of the paper I will indicate how such a generalization might affect the results, but otherwise we will stick to the Cobb Douglas formulation.

Domestic income is now given as $y = p_0 x_0 + n p_h x_h$, and excess demand for labour is $z^l = \lambda_0 + n \lambda_h - \bar{l}$. Equilibrium is given by

$$(26) \quad z^l = -\pi_w^0(p_0, w) + \frac{nk}{1-\alpha} - \bar{l} = 0$$

$$(27) \quad z^h = \frac{1}{n p_h} h(q(\frac{n}{m}, \rho)) \beta(p_0 x_0 + n p_h x_h) + \frac{1}{n p_h} H(Q(\frac{n}{M}, \rho)) B Y - x_h = 0$$

I will still use $\rho = p_h/p_f$ as the terms of trade expression. It could be argued that p_0 should enter a proper terms of trade definition, such that a rise in p_0 improves terms of trade if the country is a net exporter of good 0, and vice versa. However, as the main purpose of this exercise is to see how the results from the last section are modified when we add a perfectly competitive sector, it is convenient to let the definition of terms of trade be unchanged.

In (26) and (27) there are actually four endogenous variables, w , p_h , ρ and n , but we know that three of these are closely linked to each other. Furthermore, we know that only relative prices matter, so we can choose a numeraire. It is convenient to let $p_f \equiv 1$; then we have $\rho = p_h = (\mu/\alpha) w$. Except for the case where we study changes in μ , it does not matter whether we focus on w or ρ . However, in that special case it turns out to be convenient to determine w first, so we may as well stick to w and n as our endogenous variables throughout.

6) A proper price index is defined similarly to q_h in (2), only covering both h- and f-goods. Hence, the price index is increasing in p_h and p_f , and decreasing in n and m .

Rather than calculating comparative static effect by totally differentiating the conditions in (26) and (27), I will represent the equilibrium in a diagram, and establish comparative statics as shifts in curves. As long as we are primarily interested in effects on n and ρ (or w), the diagrammatic analysis is sufficient; if, however, we were to study welfare effects it would in some cases be necessary to perform a more rigorous comparative static analysis. I will indicate in which cases the welfare effects are unclear, but I will not go into a detailed analysis. Once again, the main purpose is to see whether the unusual terms of trade effects from the one sector model remain valid in this new setting, and this is most easily done in a diagram.

From (26) it is straightforward to see that we may write

$$(28) \quad z^l = z^l(w, n, p_0, \bar{l}, \kappa)$$

$\begin{matrix} - & + & + & - & + \end{matrix}$

hence, $z^l = 0$ is an upward sloping locus in the (w, n) -space.

It is not so easy to see from (27) that we may write

$$(29) \quad z^h = z^h(w, n, p_0, \mu, x_h, Y, m, M, \beta, B)$$

$\begin{matrix} - & + & + & - & - & + & - & - & + & + \end{matrix}$

where $x_h = \frac{\alpha}{1-\alpha} \frac{\kappa}{\mu}$, as before, and I have used $x_0 = \pi_p^0(p_0, w)$. Some of these partial effects can be seen directly in (27): p_0 , Y , β and B are all income effects, and a positive shift in either increases the budget spent on commodities from the monopolistically competitive industry. m and M reduce $h(\cdot)$ and $H(\cdot)$, respectively, with no other effects. An increase in w reduces $h(\cdot)$, $H(\cdot)$, $Y/n\rho$ and also $y/n\rho$, since we can write $y/n\rho = [p_0 \pi_p^0(p_0, w)/n\rho] + x_h$, and we know that $\pi_{pw}^0 < 0$. μ works in the same way as ρ , which equals the effect of w , except for the influence on x_0 .

Finally, we are left with the one ambiguous effect, $\partial z^h/\partial n$. A closer look at (27) reveals that exports react in the same way now as in the one-sector model: $\partial C_h/\partial n = -H C_h/n$. As we consider H to be small, this term is probably of negligible magnitude. On the home market the substitution effect (i.e. the shift in budget shares) is the same as before, but the change in income is different. We have

$$\frac{\partial c_h}{\partial n} \frac{n}{c_h} = 1 - h - \frac{p_0 x_0}{y}.$$

Define $\eta \equiv np_h x_h/y$; i.e. η is the share of domestic income stemming from the MC-sector. Then

$$(30) \quad \frac{\partial c_h}{\partial n} \frac{n}{c_h} = \eta - h.$$

In the one sector model we had $\eta = 1$ and $0 < h < 1$, and the effect was inevitably positive. With two sectors we have $0 < \eta < 1$ (if production is strictly positive in both sectors), and the expression in (30) may have either sign. It is more likely to be positive the more important the MC-sector is on the production side, and, in a sense, the less important h-goods are in consumption.⁷⁾ This is so because the elasticity of y/np w.r.t. n is $\eta - 1$, and the elasticity of c_h w.r.t. n , for a given level of y/np (i.e. the shift in the budget share), is $1 - h$.

Can anything be said about the relationship between η and h ? Not really. We know that $\eta \geq h\beta$ ⁸⁾, but as $0 < \beta < 1$ no general conclusions can be drawn from this. However, we may tentatively say that the possibility of having $\eta \geq h$ is larger

7) Remember, however, that the budget spent on h-goods as a fraction of total income is $h\beta$. Hence, what matters in (30) is not the overall spending on h-goods, but the spending on h-goods relative to the budget allocated to MC-commodities.

8) This follows from $\eta y = np_h x_h = np_h c_h + np_h C_h = h\beta y + np_h C_h$; hence $\eta = h\beta + \frac{1}{y} np_h C_h \geq h\beta$.

the closer β is to 1; to ensure strict inequality we must in addition have strictly positive demand for h-goods from abroad (so that $\eta > h\beta$) and for f-goods at home (so that $h < 1$). It seems to be difficult to say more about $\eta - h$ in general; the important point is that the effect in (30) may very well be positive.

The total effect on z^h is then given by

$$(31) \quad \frac{\partial z^h}{\partial n} = \frac{x_h}{n} \left[\frac{c_h}{x_h} (\eta - h) - \frac{C_h}{x_h} H \right].$$

If this is positive, we have the situation in figure 1, and equilibrium is given at the intersection of the two loci.

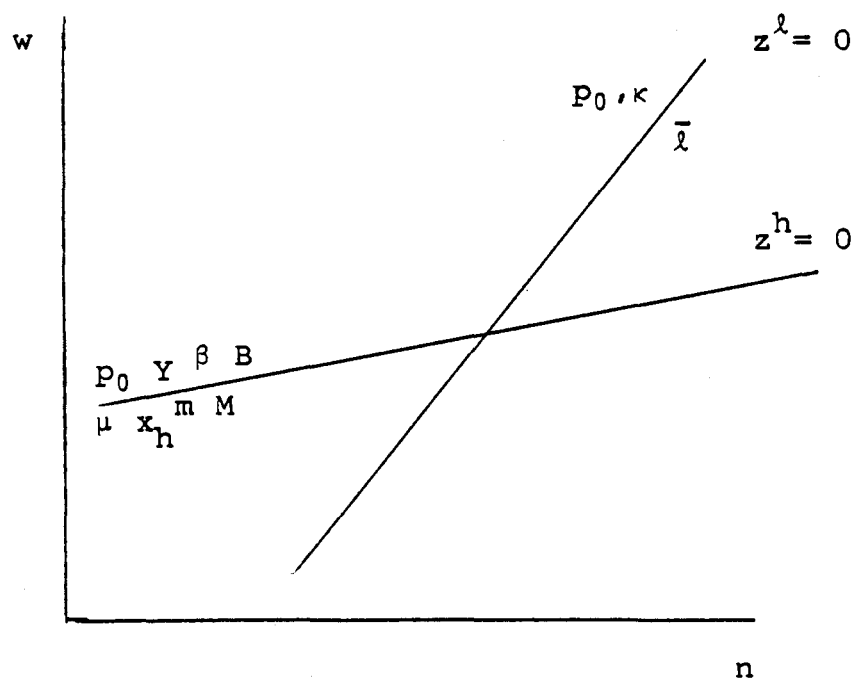


Figure 1

The location of exogenous variables above or below the curves indicate shifts in the loci associated with positive shocks in the variables.

The z^l -locus has to be the steeper one in figure 1. This can be shown in many ways, for example the following: When there is full employment domestic income may be written $y = w\bar{l} + \pi^0(p_0, w)$, i.e. domestic income equals labour income plus profits. Then $\partial y / \partial w = \bar{l} + \pi_w^0 = n\lambda_h$ and $\partial y / \partial n = 0$ along the z^l -locus, and it is easy to establish that

$$dz^h \Big|_{z^l=0} = \frac{\partial z^h}{\partial n} \Big|_y \cdot dn + \left(\frac{\partial z^h}{\partial w} \Big|_y + \frac{\partial z^h}{\partial y} n\lambda_h \right) \cdot dw < 0.$$

Hence, if n and w (or ρ) increase in such a way that the economy is on the full employment locus, then excess demand for the representative h -good falls, and it follows from this that the z^h -locus must be less steep.

Now comparative statics are easily established using the diagram. We are primarily interested in the effects of growth in the domestic labour force, $d\bar{l} > 0$, and in figure 1 this appears as a rightward shift in the full employment locus, while the z^h -locus remains unchanged. Hence, the equilibrium position moves along the z^h -locus; the number of varieties (and firms) increases, and the terms of trade improve, as long as the locus is positively sloped. Welfare also increases, both due to increased total production ($d\bar{l} > 0$), increased diversity ($dn > 0$), and improved terms of trade ($d\rho > 0$). The increase in ρ does, of course, also raise the domestic price-level, but since the home-country produces more than it consumes of h -goods, the welfare effect must be positive.

If $\partial z^h / \partial n < 0$ in (31), the $z^h = 0$ becomes a decreasing locus in the (w, n) -space, and the situation is the one in figure 2.

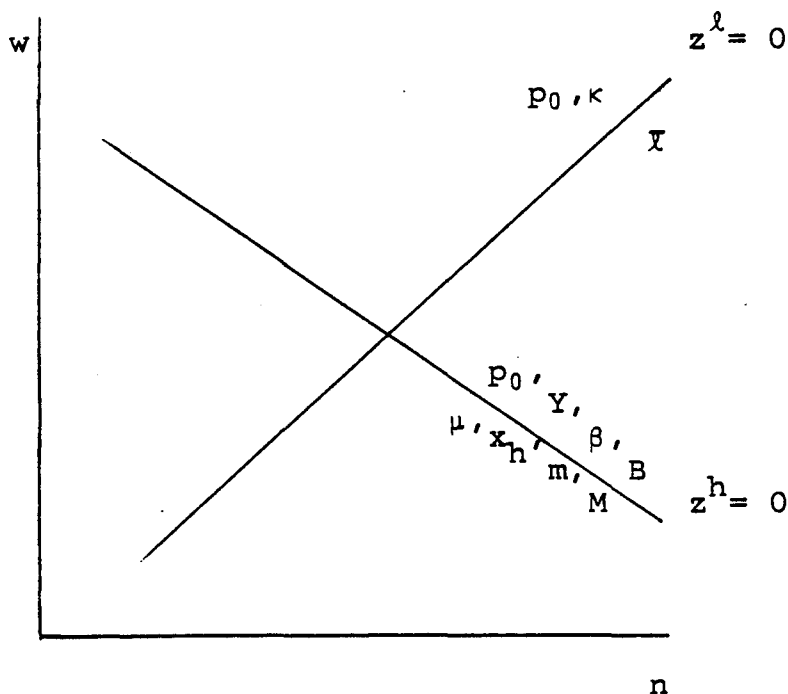


Figure 2

In this case, domestic growth yields terms of trade deterioration, but the number of firms still increases. As for welfare assessments, there are now opposing forces in action. The direct effect ($d\bar{\lambda} > 0$) and the increased diversity tend to improve welfare, while the terms of trade deterioration works in the opposite direction. Except for the change in diversity, this situation is similar to the usual textbook illustration of growth and the terms of trade; I don't even think we can rule out the possibility of 'immiserizing' growth in this case. If both loci in figure 2 are 'steep', i.e. if demand for labour in the PC-sector is inelastic, and the excess demand for a representative h-good is sensitive to a change in n , then the deterioration in ρ becomes large and the increase in n small, and it is not impossible that the total welfare effect may be negative. However, I will not explore this case here; it probably takes some rather strong assumption to get such a result, and besides, our main interest is still in the situation where domestic growth improves terms of trade. Hence, we shall concentrate on the situation in figure 1.

In the one-sector model, it was established that the terms of trade effect of a balanced improvement in productivity, i.e. $d\mu/\mu = dk/\kappa < 0$, was identical to the effect of domestic growth. This is not true any more; now such a change in productivity alters the relative costs between the sectors, and this in turn has implications for the wage rate and the terms of trade determination.^{9),10)}

Remembering that $x_h = \frac{\alpha}{1-\alpha} \frac{\kappa}{\mu}$, which is unaffected by a balanced change in κ and μ , we find the w and n effects directly from figure 1. A fall in μ shifts the z^h -locus upwards, while a fall in κ shifts the z^l -curve downwards; hence, the equilibrium position moves in a northeasterly direction, and both w and n increase.

What about ρ ? We have $d\rho/\rho = dw/w + d\mu/\mu$, but this may have either signs, depending on the magnitude of the change in the wage rate. A decisive factor turns out to be the sensitivity of ℓ_0 w.r.t. w , as can be seen in the following way. Let us assume that $dw/w = -d\mu/\mu$, so that $d\rho = 0$, and see what happens to the equilibrium conditions in this case. From the full employment condition we get

$$dz^l = -\pi_{ww}^0(p_0, w) \cdot dw + \frac{\kappa}{1-\alpha} \cdot dn + \frac{n}{1-\alpha} \cdot dk$$

hence, using $dw/w = -dk/\kappa$, full employment is ensured if n changes as follows:

$$\begin{aligned} \frac{dn}{n} &= \frac{1}{n\ell_h} (w\pi_{ww}^0 + n\ell_h) \frac{dw}{w} \\ (32) \quad &= \left[\frac{\ell_0}{n\ell_h} \left(-\frac{\partial \ell_0}{\partial w} \frac{w}{\ell_0} \right) + 1 \right] \frac{dw}{w}. \end{aligned}$$

9) ρ/w did change in the one-sector model as well, but in that model this was immaterial, since w only worked through ρ .

10) A 'neutral' productivity change would require a (properly defined) proportional improvement in the productivity of the PC-sector.

Now, let us turn to the goods market and see how z^h reacts to the above changes in w and n . Since the economy is at the full employment locus, we can use $y = \pi^0(p_0, w) + w\bar{l}$, and, neglecting the effect from exports (i.e. using $H=0$), we get

$$dz^h = -\frac{c_h}{n} h \cdot dn + \frac{c_h}{y} n \ell_h \cdot dw$$

or, using (32)

$$(33) \quad dz^h = c_h \left[-h \cdot \left(1 - \frac{\ell_0}{n \ell_h} \frac{\partial \ell_0}{\partial w} \frac{w}{\ell_0} \right) + \eta \right] \frac{dw}{w} .$$

The sign of this obviously depends on the elasticity of ℓ_0 w.r.t. w and on the relative size of the sectors. We know (by assumption) that $\eta > h$, but this is not enough to ensure a positive sign, since there is the additional negative effect through the fall in employment in the competitive sector.

If dz^h is positive at unchanged terms of trade, it follows that an increase in ρ is needed to restore equilibrium, and vice versa; hence the sign of the expression in (33) is decisive for the terms of trade effect of the improvement in productivity.

Finally, let us take a look at the effects of foreign growth. Qualitatively, the terms of trade effects are the same now as in the one-sector model. An increase in Y shifts the z^h -locus upwards; the same is true, but not to the same extent, if Y and M increase simultaneously. If, however, there is a rise in m as well, the z^h -locus may very well shift downwards. In the one-sector model these shifts took place at a given level of n ; now the movements are along the full employment locus, implying that n also varies. As far as the sign of the terms of trade effect is concerned, this does not matter, but if we were to assess the impact on welfare, the difference may be crucial. In the one-sector model it was possible to establish that foreign growth inevitably improved welfare, even if the

changes in M and m were such that our terms of trade deteriorated. Now the situation becomes more complicated, since the increase in m (which ensured the positive welfare effect before) is accompanied by a fall in n , and at our level of generality, it is impossible to conclude what the total welfare effect will be.

Above it was mentioned that applying a more general (homothetic) utility function might have implications for the results. Without going into details, it is easy to see that if commodities from the two sectors are gross substitutes, β will increase when n rises (see footnote 6). But this increases the possibility of having an upwards-sloping z^h -locus, and in this way such a generalization of the demand side may actually reinforce our results.

CONCLUDING REMARKS

In standard theory of international trade in homogeneous products one often uses the case of domestic growth as an illustration of the importance of taking terms of trade effects properly into account. The story goes like this: Growth in the domestic factor supply implies increased world supply of at least some of the domestically produced commodities. If there was equilibrium initially, unchanged prices yield excess supply of these commodities after the shift, and to restore equilibrium a price-fall is necessary. Depending on whether the growth takes place mainly in the export or in the import-competing sector (in a two-sector setting), the terms of trade may deteriorate or improve. In e.g. a Heckscher-Ohlin model this can be related to the relative factor-intensities in the sectors, and if the country is already relatively abundant in the factor that grows, the terms of trade will inevitably deteriorate. Furthermore, there is no guarantee that the terms of trade deterioration does not outweigh the benefits

from increased production, thus leaving the country worse off than it was initially. This is the well-known case of immiserizing growth.

How can our results be related to this story? Growth in our model obviously takes place in the exporting sector, since all h-goods are exported. Nevertheless, we found that the terms of trade effect associated with the growth may very well be positive. Hence, rather than reducing the benefits from the increased production capacity, the terms of trade change may reinforce the positive welfare effects. In our model, as in the standard model, the increased labour supply raises the aggregate supply of h-goods, but unlike the standard case, the increased supply comes as new varieties in our model, and this has direct implications for the demand-side. With increased diversity of home-produced goods, and no change for the imported ones, people (both at home and abroad) tend to reallocate their budget towards h-goods. Thus at unchanged prices the aggregate demand for domestic commodities will increase, and the effect on excess demand depends on the relative magnitude of the shifts in supply and demand. In the one-sector model we found that the demand effect (including the income effect from increased domestic production) actually had to be the bigger one; hence excess demand for h-goods increased and the terms of trade had to rise to restore equilibrium in the goods market. The same effect was a possible outcome in the two-sector model, but in that case a deterioration of the terms of trade was also possible. Roughly speaking, the monopolistically competitive sector had to be relatively important on the production side (i.e. in generating domestic income) to ensure that the terms of trade effect was positive.

The special effects in our model obviously stem from the endogeneity of the number of different varieties. If, for some reason, the number of firms and varieties were given, our results regarding terms of trade determination would be very similar to those from standard trade theory. (The only major difference would be that we obtain these effects for a small

country, whereas in the theory of trade in homogeneous products, only large countries have an influence on the terms of trade.) But this gives rise to an interesting distinction between short-run and long-run analysis for an economy like the one we have studied. In the short run (with n given) the terms of trade behave very much as in the standard trade theory, but in a long-run analysis the conclusion must differ substantially.

Apart from noting that there are differences, we should not put too much emphasis on the comparison with the theory of trade in homogeneous products. After all, the models are completely different; they are constructed to explain different phenomena, and it is no wonder they yield different results. While the standard trade theory explains inter-industry trade, the analysis in the present paper takes the structure of such trade as given, and concentrates on trade in similar, differentiated products. A possibly interesting extension of this analysis might be to introduce our assumptions of smallness and openness in a two-sector model with two factors of production. As mentioned in the introduction, such a model would typically explain intersectoral trade by factor abundance arguments (see e.g. Dixit and Norman (1980, chapter 9.2)), while the monopolistically competitive sector would be like the one we have analysed in this paper. Then we might possibly be able to relate the conditions from our two-sector model to the question of comparative advantage and factor intensities. This must, however, be a topic for future research.

In the introduction it was established that models with intra-industry trade usually have terms of trade (in my definition, i.e. relative prices within the group of differentiated products) equal to unity. It is easy to check that this will be the case in our model as well, if we apply the standard assumptions from this literature. If all commodities are traded internationally (i.e. $m = M$), and technologies are identical

(which would imply that all firms, domestic and foreign, produce at the same scale, and that M is determined from a criterion similar to the one for n in (18)), then it is not difficult to establish from (17'), or from (27) for the two-sector case, that ρ has to be equal to 1 in equilibrium. Hence, under these assumptions domestic growth would have had no effect on the terms of trade; the increase in aggregate domestic production would be met by an identical shift in world demand for our commodities, and excess demand would remain unchanged.

As far as I know, the question of terms of trade determination in models with imperfect competition has not been much discussed in the literature. One exception is Dixit (1982), who does take up certain aspects of the relationship between growth, technical progress, tariffs, etc. and the terms of trade, when there is imperfect competition. His model is, however, quite different from the one we have studied, and the results cannot be compared. He studies trade between less-developed (LDC) and developed countries (DC), and only the DCs are engaged in the increasing returns to scale industry. The LDCs supply intermediate goods, produced under constant returns to scale. But then, trade in his model is not of the intra-industry kind, and although the imperfect competition is important for the terms of trade determination in his model as well, the mechanisms in action are completely different from those we have studied.

REFERENCES

- Dixit, A. (1982): Growth and Terms of Trade under Imperfect Competition, mimeographed, Princeton University.
- Dixit, A. and Norman, V. (1980): Theory of International Trade, Cambridge University Press, Cambridge.
- Helpman, E. (1984): Increasing Returns, Imperfect Markets, and Trade Theory, in Jones and Kenen (eds): Handbook of International Economics, vol 1, North Holland, Amsterdam.
- Horn, H. (1983): Some implications of non-homotheticity in a two-sector general equilibrium model with monopolistic competition, Journal of International Economics 14, 85-101.
- Krugman, P. (1979): Increasing Returns, Monopolistic Competition, and International Trade, Journal of International Economics 9, 469-479.
- Krugman, P. (1980): Scale Economies, Product Differentiation, and the Pattern of Trade, American Economic Review 70, no.5, 950-959.