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Raising Economic Growth in Austria

Final Draft Version

Karl Aiginger, Michael Böheim, Martin Falk, Markus Marterbauer, Michael Peneder

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Vorwort

Österreichs Wirtschaft ist bis zur Mitte der 90er Jahre - gemessen an den Zuwachsraten des BIP je Einwohner – rascher gewachsen als die Mitglieder der Europäischen Union. Damit ist es in die Gruppe der fünf Länder mit dem höchsten Pro-Kopf-Einkommen aufgestiegen. Seit Mitte der 90er Jahre wächst Österreichs Wirtschaft mit 1,8% pro Jahr etwas langsamer als die EU-15 mit 2,0% pro Jahr. Insbesondere liegt Österreich damit in der Wachstumsdynamik deutlich hinter den drei nordischen Ländern, Dänemark, Finnland und Schweden[1]. Diese Entwicklung wirft folgende Fragen auf: Erstens warum ist das Wachstum nicht so dynamisch wie in den Top 3 der EU-Länder und zweitens welche wirtschaftspolitischen Maßnahmen ergriffen werden müssen, um das Wirtschaftswachstum in Österreich zu beschleunigen.

Zur Beantwortung dieser Fragen werden in dieser Studie die zentralen Determinanten des Wirtschaftswachstums auf Basis von Quer- und Längsschnittsdaten für die OECD-Länder analysiert. Darüber hinaus ist wichtig, wie wirtschaftspolitische Instrumente auf die zentralen Inputfaktoren des Wirtschaftswachstums (z.B. Investitionen, Forschung und Entwicklung und Humankapital) wirken. Über die Ursachen des Wirtschaftswachstums in den Industrieländern gibt es eine umfangreiche Literatur (z.B. "OECD growth project"; Bosworth – Collins, 2003), die ein relativ einheitliches Bild liefert. Insbesondere betont die OECD (2003) den wachstumsfördernden Einfluss von Innovationen, Forschung und Entwicklung, Wissen sowie Informations- und Kommunikationstechnologien (IKT) und Deregulierung in den Netzwerkindustrien und auf den Gütermärkten. Das unterschiedliche Niveau sowie die Dynamik dieser Zukunftsinvestitionen könnten einen wichtigen Beitrag zur Erklärung der Wachstumsdifferenzen zwischen Österreich und der EU 15 insgesamt bzw. den Top 3 der EU-Länder liefern. Zur Abschätzung dieser Effekte wird, aufbauend auf den Ergebnissen der Wachstumstheorie und unter Nutzung der empirischen Literatur, ein ökonometrisches Modell für die OECD Länder über die Periode 1980 bis 2002 geschätzt, was besonders die für Österreich und zur Erreichung der Lissabonziele wichtigen Aspekte betont.

Auf der Nachfrageseite kann eine wichtige Ursache für den Verlust des Wachstumsvorsprungs Österreichs seit Mitte der 90er Jahre in der Wachstumsschwäche seiner beiden bedeutendsten Absatzmärkte, nämlich Deutschland und Italien liegen. Demgegenüber steht ein höheres Wachstum in den neuen EU-Ländern. Der Gesamtbeitrag der Exporte zum Wirtschaftswachstum wird ermittelt. Dynamik und Struktur der Investitionen, der Effekt der Volatilität der Nachfrage und die Stabilität der Konsumnachfrage werden analysiert.

Der Inhalt der Studie ist wie folgt strukturiert: In Kapitel 1 werden zunächst auf Basis der Wachstumstheorie Schlüsselfaktoren des Wirtschaftswachstums ermittelt. Anschließend werden Österreichs Position bzw. Defizite bei diesen Faktoren aufgezeigt. Dabei werden nicht

[1] Diese drei Länder, Schweden, Finnland und Dänemark werden wegen ihrer innovationsbasierten Wirtschaftsdynamik in dieser Studie Top 3 der EU-Länder genannt.

nur die Niveaus sondern auch die Dynamik der Indikatoren betrachtet. Anschließend werden die zentralen Einflussfaktoren des Wirtschaftswachstums mit Hilfe ökonometrischer Methoden bestimmt. Basierend auf den ermittelten Effekten der Faktoren und ihrer tatsächlichen Entwicklung wird eine Zerlegung der Wachstumsraten vorgenommen. Auf Basis der Modellergebnisse werden dann Vorschläge für die zukünftige Wirtschafspolitik in Österreich abgeleitet.

In Kapitel 2 wird die Bedeutung des Exports, der Investitionen und des privaten Konsums für das Wirtschaftswachstum analysiert (Markus Marterbauer). Eine zentrale Frage stellt der Nettobeitrag des Exportes zum BIP-Wachstum dar. Insbesondere wird untersucht, inwieweit das Wirtschaftswachstum in Österreich von der Wachstumsschwäche in den bisherigen Hauptabsatzmärkten verringert bzw. von der regen Nachfrage aus den neuen EU-Ländern unterstützt wurde. Anschließend werden in Kapitel 3 der Beitrag der Wettbewerbspolitik und der Liberalisierung auf das Wirtschaftswachstum untersucht (Michael Böheim). In Kapitel 4 wird der Zusammenhang von Unternehmensgründungen und Wirtschaftswachstum dargestellt (Michael Peneder). Die Studie schließt mit Kapitel 5, der Zusammenfassung.

Wien, im Juni 2004.

0. Das Wichtigste in Kürze

1. Österreichs Wirtschaft ist seit Mitte der 90er Jahre etwas langsamer gewachsen als die Europäische Union. Zwischen 1996 und 2003 belief sich die Zuwachsrate des BIP je Einwohner in Österreich im Durchschnitt auf 1,8% pro Jahr. Im selben Zeitraum wuchs die Europäische Union (EU-15) um 2,0 %. Dabei ist das Wirtschaftswachstum der EU-Länder insgesamt ungleicher geworden. Während Länder mit einem niedrigen Pro-Kopf Einkommen (Griechenland, Irland, Portugal und Spanien) wie erwartet aufholen, sind auch EU-Länder mit einem relativ hohen Pro-Kopf-Einkommen schneller gewachsen als die EU-15 insgesamt. Dies gilt insbesondere für die Top 3 der EU-Länder (Finnland, Schweden und Dänemark), die sich nach der Strukturkrise zu Beginn der 90er Jahre, nunmehr seit mehr als 10 Jahren, dynamischer entwickelten als die meisten der EU-Länder. Zwischen 1996 und 2003 betrug die Zuwachsrate des BIP je Einwohner in den Top 3 der EU-Länder im Durchschnitt 2,5% pro Jahr. Auf Grund ihres innovationsbasierten Wachstumsvorsprungs verwenden wir sie als „obere benchmark".
2. Im Zeitraum von 1970 bis 1995 ist das BIP je Einwohner in Österreich mit durchschnittlich 2,5 % pro Jahr stärker gewachsen als in der EU-15 mit durchschnittlich 2% pro Jahr. Damit konnte Österreich im Pro-Kopf-Einkommen eine Spitzenposition in der EU-15 erringen. Durch das geringere Pro-Kopf-Wachstum seit 1995 (bei gleich hohem realen Wachstum) ist der Vorsprung wieder etwas geschrumpft. Der Abstand zur EU liegt jetzt, je nach Messung pro Kopf oder pro Erwerbsbevölkerung bei 10% oder 9 %, etwa in der Höhe von 1990. Der Einkommensvorsprung zu den Top 3 EU-Ländern ist dagegen weitgehend verloren gegangen. Gemessen an dem BIP je Einwohner im erwerbsfähigen Alter liegen die Top 3 EU-Länder seit 2000 sogar über dem österreichischen Pro-Kopf-Einkommen.
3. Die Ursachen für die Wachstumsschwäche der österreichischen Wirtschaft seit 1995 sind vielfältig. Ein Hauptgrund für das in Österreich geringere Wirtschaftswachstum seit Mitte der 90er Jahre liegt in der, über einen langen Zeitraum hinweg, verhaltenen Neigung zu Zukunftsinvestitionen in F&E, Bildung und IKT sowie einer zunächst zögerlichen Deregulierung in den Netzwerkindustrien. Trotz einiger Anstrengungen in den letzten Jahren –insbesondere in den Bereichen F&E und im Bildungssystem sowie in der Liberalisierung der Netzwerkindustrien– ist das Wachstum, teils durch zu geringe Ausgaben, teils durch organisatorische Defizite, ungenügend unterstützt worden.
4. Eine weitere wichtige Ursache für das seit 1995 geringere Wachstum in Österreich besteht in der schwachen Wirtschaftsentwicklung seiner bedeutendsten Absatzmärkte, vor allem Deutschlands, aber auch Italiens. Diese Entwicklung konnte durch das relativ hohe Wirtschaftswachstum in den neuen EU-Ländern nur zu einem geringen Teil ausgeglichen werden.
5. Eine empirische Analyse für den Zeitraum der letzten 20 Jahre bestätigt den positiven Wachstumseffekt von Zukunftsinvestitionen in F&E, Bildung, IKT und Deregulierung. Eine Erhöhung des Humankapitalbestands (gemessen als durchschnittliche Jahre an Bildung) um ein zusätzliches Schuljahr (d.h. statt 12, 13 Schuljahre) kann das BIP je

Einwohner in Österreich um ca. 2.5% pro Jahr erhöhen. Eine Anhebung der F&E-Quote im Unternehmenssektor um 10 Prozent (d.h. z.B. von 1,3% auf 1,4%) erhöht in Österreich das BIP je Einwohner mittelfristig (innerhalb eines Zeitraum von fünf Jahren) um 0,6 % pro Jahr. Schon die „privaten Erträge" auf das eingesetzte F&E Kapital ("private rate of return to R&D") sind damit sehr hoch. Nicht berücksichtigt sind dabei Wissens-externalitäten, sodass die „sozialen Erträge" von F&E noch höher liegen dürften. Positive Wachstumseinflüsse gehen auch von staatlichen Forschungsinvestitionen im Hochschulbereich aus.

6. Investitionen des Unternehmenssektors und des Staates haben in den Modellberechnungen ebenfalls einen signifikanten positiven Effekt auf das Wirtschaftswachstum. In Österreich - wie auch im Durchschnitt der OECD-Länder - führt eine Erhöhung der Investitionsquote des Unternehmenssektors um ein Prozent, zu einer Zunahme des BIP pro Kopf um mittelfristig (innerhalb von fünf Jahren) 0,2 Prozent pro Jahr.
7. Ein Kennzeichen der österreichischen Wirtschaft sind die geringen Schwankungen des Wirtschaftswachstums in Relation zu den übrigen EU-Ländern. Der Variationskoeffizient des Wirtschaftswachstums liegt in Österreich, seit Mitte der 80er Jahre, deutlich niedriger als im Durchschnitt der EU-Länder[2]. Dagegen sind die Top 3 der EU-Länder von einer hohen Volatilität des Wirtschaftswachstums gekennzeichnet, insbesondere in der ersten Hälfte der 90er Jahre.
8. Die Zerlegung des Pro-Kopf-Wachstums auf die einzelnen Determinanten zeigt, dass von dem durch das Modell erklärte Wachstum in Österreich von 2,1 % im Zeitraum 1990 bis 2002, jeweils 0,3 % auf den steigenden Einsatz von Humankapital und auf die Erhöhung der F&E Ausgaben im Unternehmenssektor (von 0,8 % auf 1,3 %) zurückzuführen waren[3]. Die Liberalisierung der Netzwerkindustrien und die Innovationen im Bereich IKT haben jeweils 0,1 % zum Wachstum beigetragen. Insgesamt haben diese vier Faktoren einen Beitrag von 0,8 Prozentpunkten geliefert. In den drei führenden EU-Ländern betrug der Wachstumsbeitrag dieser Faktoren jedoch 1,1 Prozentpunkte. Somit kann nahezu die Hälfte der Wachstumsunterschiede zwischen Österreich und den TOP 3 der EU-Länder, auf die schnellere Akkumulation von F&E, IKT sowie der Deregulierung zurückgeführt werden.
9. Eine empirische Analyse des Beitrags des Exports zum Wachstum zeigt, dass die Wachstumsschwäche in Deutschland seit 1994 $^1/_3$ Prozentpunkt an BIP-Wachstum pro Jahr gekostet hat. Dies konnte durch den langsamen Aufholprozess in den Beitrittsländern nur zu einem kleinen Teil ausgeglichen werden. Noch zu Beginn der 90er Jahre hat der durch die deutsche Vereinigung ausgelöste Nachfrageboom der heimischen Wirtschaft kräftige Impulse verliehen. Die empirische Analyse für Österreich zeigt außerdem, dass vom Export deutlich stärkere Wachstumsimpulse ausgingen, als

[2] Der Variationskoeffizient ist definiert als Standardabweichung bezogen auf die durchschnittliche Wachstumsrate in der entsprechenden Periode.

[3] Die Zerlegung der Wachstumsbeiträge der einzelnen Variablen erfolgt mittels der Koeffizienten der Wachstumsgleichung multipliziert mit der Veränderung der erklärenden Inputfaktoren.

eine Gegenüberstellung von Import- und Exportwachstum erkennen lässt. Seit Beginn der 90er Jahre kann bis zu ein Drittel des heimischen Wirtschaftswachstums durch den Nettobeitrag des Exports erklärt werden. Zudem haben die österreichischen Exportunternehmen auf wichtigen Absatzmärkten Anteile gewonnen.

10. Die fehlende Dynamik der Binnennachfrage hat ebenfalls einen negativen Einfluss auf das Wirtschaftswachstum. Seit Mitte der 90 er Jahre blieb die Expansion des privaten Konsums verhalten, vor allem im Vergleich zu jenen Ländern, in denen der Sparanteil am verfügbaren Einkommen merklich zurückging.

11. Der potentielle Beitrag der Investitionen zum Wirtschaftswachstum wurde in dem letzten Jahrzehnt nicht genutzt. Eindeutig wachstumshemmend wirkte sich der starke Rückgang der öffentlichen Investitionen, selbst unter Berücksichtigung der Umschichtung von öffentlichen zu privaten, aus. Der negative Wachstumsbeitrag der staatlichen Investitionen bewirkt längerfristig (1990/2002) 0,3 Prozentpunkte pro Jahr und für den kürzeren Zeitraum ab Mitte der 90er Jahre nahezu einen halben Prozentpunkt. Dagegen ist in den Top 3 der EU-Länder die staatliche Investitionsquote seit Beginn der 90er Jahre stabil geblieben oder nur leicht zurückgegangen.

12. Bei der Beurteilung des Wachstumseffektes der Investitionen in Österreich ist jedoch zu berücksichtigen, dass Österreich nach Portugal und Spanien eine der höchsten Anteile von Investitionen am BIP hält. Die Investitionsquote Österreichs liegt um 2 Prozentpunkte höher als im EU Schnitt und 3 Prozentpunkte über den Top 3 der EU-Länder[4]. Besonders der Anteil der Bauinvestitionen ist hoch. Ein überdurchschnittlicher Anteil physischer Investitionen, bei gleichzeitigem Defizit an immateriellen Investitionen[5], ist typisch für Länder mit geringerem Pro-Kopf-Einkommen.

13. Die potentiellen Einflussfaktoren auf das Wirtschaftswachstum umfassen nicht nur den engen Bereich von F&E, Humankapital und Regulierung, sondern auch fiskalpolitische Faktoren. Unterschiede in der Finanzpolitik können einen signifikanten Einfluss zur Erklärung von Wachstumsunterschieden zwischen Ländern liefern. Die empirische Analyse für den Zeitraum 1980 bis 2002 zeigt, dass Schuldenquoten der öffentlichen Haushalte, Budgetdefizit, Steuerquote, indirekte Steuern, Sozialabgabenquote, Staatskonsum und Subventionsquote langfristig einen negativen Einfluss auf das Wirtschaftswachstum in Österreich und in der EU 15 haben könnten. Die Ergebnisse sind mit größter Vorsicht zu interpretieren. Erstens kann die Kausalität in beide Richtungen laufen und zweitens können finanzpolitische Einflussgrößen und Wirtschaftswachstum in einem nichtlinearen Zusammenhang stehen.[6] Eine höhere Defizitquote könnte damit bei einem niedrigen Niveau positive Wachstumseffekte auslösen. Der Beitrag der Fiskalpolitik zur Stabilisierung der Konjunktur wirkt ebenfalls wachstumsfördernd. Eine Aufspaltung der Staatsausgaben in öffentlichen Konsum und Subventionen zeigt einen

[4] Diese Zahlen beziehen sich auf den Schnitt 2000/2002, für andere Perioden ist der Unterschied noch größer.

[5] Zu den immateriellen Investitionen zählen Patente und Lizenzen, Software und Forschung und Entwicklung.

[6] Der Zusammenhang zwischen der Finanzpolitik ist nicht Aufgabe dieser Studie, sondern bedarf einer gesonderten Untersuchung.

negativen Wachstumseffekt, staatliche Ausgaben für Infrastruktur und Ausbildung erhöhen das Wirtschaftswachstum.

14. Auch die unterschiedliche Entwicklung des Staatskonsums kann einen Teil der Wachstumsunterschiede zwischen den Top 3 der EU-Länder und Österreich erklären. Während der Anteil des staatlichen Konsums am BIP in Österreich zwischen der ersten Hälfte der 90er Jahre und 2000er Jahre um einen halben Prozentpunkt abnahm, ist er in den Top 3 der EU-Länder um 1,5 Prozentpunkte geschrumpft. Die Entwicklung der volkswirtschaftlichen Steuerquote kann jedoch keinen Beitrag zu den Wachstumsunterschieden zwischen den Top 3 der EU-Länder und Österreich leisten, da diese in beiden Regionen ähnlich verlief.

15. Bei der Forschungsquote im Unternehmenssektor hat Österreich in den 90er Jahren im Vergleich zu den meisten der EU Länder aufgeholt. Im Jahr 2004 wird die gesamtwirtschaftliche F&E Quote in Österreich voraussichtlich 2,3 % betragen und dürfte damit den EU-Durchschnitt überschreiten (EU- Wert für 2002: 2,0%). Verglichen mit den Top 3 der EU-Länder bleibt der Abstand konstant. Im Durchschnitt dieser drei Länder liegen die Forschungsausgaben bereits über dem Lissabonziel für 2010. In Österreich ist noch eine Erhöhung der Steigerungsraten der staatlichen und privaten Ausgaben erforderlich, um das 2,5 %-Ziel für das Jahr 2006 sowie das 3,0 %-Ziel für 2010 im F&E Bereich zu erlangen. Auch die F&E-Ausgaben der Hochschulen und außeruniversitären Forschungseinrichtungen liegen unter dem Referenzpfad für das Lissabonziel.

16. Österreich hat die steuerliche Förderung für F&E seit Mitte der 80er Jahre kontinuierlich erhöht und liegt nach den jüngsten Verbesserungen mit Spanien und Portugal am oberen Ende der Rangliste in Europa. In den unmittelbaren Nachbarländern Schweiz und Deutschland sowie in Schweden und Finnland werden dagegen F&E-Ausgaben steuerlich kaum gefördert (Ausnahme: KMUs in Italien). Bei der direkten Projektförderung (Subvention für F&E im Unternehmenssektor) liegt Österreich unter dem EU-Durchschnitt. In Finnland und Schweden Ibefindet sich der Anteil der direkten Förderung für F&E in Relation zum BIP über dem von Österreich. Die direkte Förderung von F&E in Österreich kommt vor allem kleinen Firmen zugute und stellt somit eine gute Ergänzung zur fehlenden steuerlichen Sonderbehandlung kleiner und mittlerer Unternehmen dar.

17. Gemessen an der durchschnittlichen Dauer der Schulausbildung (12,2 Jahre) liegt Österreich im Spitzenfeld der EU-Länder, über den Top 3 der EU-Länder, jedoch unter Ländern mit einem vergleichbaren Bildungssystem (z.B. Schweiz). Österreich verfügt über ein gut ausgebautes Lehrlingsausbildungssystem, welches in dieser Form in vielen anderen Ländern, so auch in Skandinavien nicht existiert. Allerdings besteht auch in diesem Bereich ein Modernisierungs- und Anpassungsbedarf an die Arbeitsmarkt-situation sowie die Anforderungen der Wissensgesellschaft. Defizite der Hochschul-absolventenquote werden somit durch Stärken im Bereich der mittleren Qualifikations-ebene kompensiert.

18. Im internationalen Vergleichen liegt Österreich mit der Hochschulabsolventenquote, trotz beachtlicher Erfolge z.B. im Bereich der Fachhochschulen und durch die

Einführung von Kurzstudien, weiterhin zurück; viel weiter als man angesichts der hohen öffentlichen Bildungsinvestitionen im Hochschulbereich erwarten würde. Dies gilt selbst dann, wenn man die Überschätzung der Bildungsausgaben in diesem Bereich berücksichtigt. Selbst Nachbarländer mit einem vergleichbaren Bildungssystem wie z.B. Deutschland haben eine höhere Hochschulabsolventenquote. Mit der Öffnung der Fachhochschulen für Absolventen der einschlägigen Lehrberufen bzw. Ausbildungszweige ist hierbei eine wichtige Maßnahme getroffen worden. Seit einigen Jahren können an den Fachhochschulen Bewerber mit dem Nachweis einer einschlägigen beruflichen Qualifikation und ohne Reifeprüfungszeugnis zugelassen werden. Finnland hat sich als Ziel gesetzt, dass 70 % eines Jahrganges zukünftig einen Tertiärabschluss haben sollen.

19. Österreich liegt mit einer Studienberechtigtenquote (Maturantenquote) von 36% im Jahr 2001 im unteren Bereich der Rangliste der EU-Länder und damit auf dem Niveau der Schweiz, Deutschlands und Luxemburgs. Dagegen können in den Top 3 der EU-Länder fast alle Absolventen der Sekundarstufe II eine Hochschule besuchen (71% in Schweden und 91% in Finnland). In diesen Ländern wird die Selektion unter den Studienberechtigten in das tertiäre Bildungssystem verlagert.

20. Besonderes bedenklich ist die niedrige Absolventenquote hinsichtlich der technik-relevanten Fächergruppen Mathematik, Naturwissenschaft und Ingenieurwissen-schaften. In Österreich erwirbt mit 7 von 1000 Personen zwischen 25 und 34 Jahren, ein sehr viel kleinerer Teil einen einschlägigen, naturwissenschaftlichen, technischen Hochschulabschluss. Zudem gehört Österreich zu den Ländern mit den längsten Studienzeiten (7,3 Jahre), welche länger sind als in den Ländern mit einem ähnlichen Hochschulsystem, wie z.B. der Schweiz oder Deutschland.

21. Österreich hat auch ein Defizit bei den betrieblichen und außerbetrieblichen Weiterbildungsaktivitäten (etwa gemessen am Anteil der Teilnehmer von Weiterbildungskursen einschließlich der Erstausbildung). Bedenklich ist der Rückgang der Weiterbildungsteilnahme in den letzten Jahren. In Ländern mit einem vergleichbaren Bildungssystem ist die Bereitschaft zur Weiterbildungsteilnahme höher. Der rasche technische Wandel, das Vordringen der Erweiterungsländer in das mittlere Qualitätssegment und das aus demographischen Gründen sinkende Arbeitsangebot machen die Weiterbildung zu einer zentralen Wettbewerbsdeterminante.

22. Österreich liegt bei der Diffusion der Informationstechnologien im Mittelfeld der EU-Länder. Die Zahl der Internetnutzer hat zwischen 1999 und 2001 rasch zugenommen, liegt aber immer noch unter dem EU-Durchschnitt. Die Zugangstarife ins Internet (access costs) sind in Österreich im Vergleich zu den anderen EU-Ländern zuletzt stark gesunken. Dies verweist auf eine erfolgreiche Deregulierung im Telekommunikationssektor und eine starke Wettbewerbsintensität in diesem Bereich. Auch bei der Internet-Infrastruktur ist Österreichs Position gut. Die Zahl der Breitbrand-Internetanschlüsse liegt deutlich über dem EU-Durchschnitt, jedoch unter den Top 3 der EU-Länder.

23. Ein eindeutiges Defizit besteht im Bereich der Innovationen in IKT. Gemessen an dem Anteil der IKT-Patente an den Patenten insgesamt, liegt Österreich sowohl bei dem Niveau als auch der Dynamik im unteren Bereich der EU-Staaten.

24. Bei der unternehmerischen Aktivität liegt Österreich im unteren Mittelfeld der EU-15-Länder. Im Zeitraum 1995 bis 2000 lag die Gründungsrate (Unternehmensgründungen bezogen auf den Unternehmensbestand) bei durchschnittlich ca. 7 %. Aber auch in Dänemark und Schweden liegen die Gründungsraten unter dem EU-Durchschnitt. Unsere empirische Analyse auf Basis der OECD-Länder zeigt, dass Unternehmensgründungen einen entscheidenden Beitrag zu Wachstum und Beschäftigung liefern.

25. Die empirische Analyse zu dem Zusammenhang zwischen Gründungsintensität und Wachstum zeigt, dass Sektoren mit hoher Turbulenz im Unternehmensbestand und insbesondere bei ansteigender Anzahl der Unternehmen auch durch ein signifikant größeres Wachstum an Wertschöpfung und Beschäftigung gekennzeichnet sind. Allerdings weisen jene Branchen mit relativ stabilem Unternehmensbestand die beste Produktivität auf.

26. Österreichische Unternehmen müssen bei der Gründung einer Gesellschaft mit beschränkter Haftung mehr Genehmigungsverfahren durchlaufen als im Durchschnitt der EU-Länder und besonders im Vergleich zu den Top 3 der EU-Länder. Zudem dauert es erheblich länger bis Genehmigungen erteilt sind. Insgesamt liegt Österreich mit den Kosten und dem zeitlichen Aufwand für die Gründung einer GmbH höher als fast alle anderen EU-Länder. Dies liegt vor allem an dem hohen Betrag für das einzuzahlende Stammkapital.

27. In internationalen Vergleichen rangiert Österreich hinsichtlich der Produktmarktregulierung im Mittelfeld. Wie in anderen kleinen offenen Volkswirtschaften auch, liegt die Marktkonzentration in Österreich über dem OECD Durchschnitt. Überdurchschnittliche Preis-Kosten-Margen werden in Österreich vor allem im Dienstleistungssektor, allen voran im Einzelhandel sowie bei Hotels und Restaurants, realisiert, während in der Sachgütererzeugung nur die Stahlerzeugung ("basic metals") durch hohe Gewinnaufschläge (mark-ups) auffällt. Die hohen Gewinnaufschläge sind auf den Qualitätsvorsprung in der Stahlerzeugung zurückzuführen und nicht auf die zu geringe Wettbewerbsintensität. Niedriger als im OECD-Durchschnitt liegen die mark-ups in den Netzwerkindustrien Elektrizität, Gas und Telekommunikation, was auf eine erfolgreiche Deregulierung, gestützt durch vergleichsweise frühzeitige Marktliberalisierung in diesen Sektoren, hinweist. Die steigende Marktkonzentration im Energiesektor –zurückzuführen auf Zusammenschlüsse von österreichischen Energieunternehmen in die "Österreichische Strom- und Gaslösung"– könnte die zu erwartenden volkswirtschaftlichen Vorteile aus der Energiemarktliberalisierung hinsichtlich sinkender Preise und stärkerem Wettbewerb verringern.

28. In Österreich sind die Lohnnebenkosten seit Ende der 80er Jahre bis Mitte der 90er Jahre im Vergleich zum EU-Durchschnitt stärker gestiegen. Die Differenz zwischen Personalaufwand für den Unternehmer und dem Nettolohn für den Arbeitnehmer liegt in Österreich bei verheirateten Personen unter dem EU-Durchschnitt, bei Singles

darüber. In den Top 3 der EU-Länder blieben die Lohnnebenkosten im gleichen Zeitraum dagegen stabil und sind seit Mitte der 90er Jahre relativ stark gesunken. Die Zusammenhänge zwischen Lohnnebenkosten und Wirtschaftswachstum können an dieser Stelle nicht ausführlich zusammengestellt werden, sondern bedürfen einer gesonderten Untersuchung, die ebenso das Arbeitsangebot wie auch die Arbeitsnachfrage einbezieht.

Wirtschaftspolitische Empfehlungen

1. Aus der Analyse lassen sich die Hauptlinien einer Strategie zur Hebung des Wirtschaftswachstums ableiten. Wachstumssteigernd sind Maßnahmen im Bereich von Ausbildung und Weiterbildung, von Forschung und Infrastruktur, die Stabilisierung von Erwartungen und Konjunktur sowie ergänzend eine Forcierung von Betriebsgründungen, Wettbewerb und die Nutzung neuer Exportchancen.
2. Der Anteil der Investition in Sachkapital liegt in Österreich um 2 % höher als im EU-Schnitt und um 3,5% höher als in den Top 3 der EU-Länder. Im Bereich der immateriellen Investitionen liegt Österreich etwa im EU-Durchschnitt, aber deutlich niedriger als die Top 3 der EU-Länder. Diese Tatsache würde z.B. für Investitionen, der durch das Auslaufen der Investitionszuwachsprämie freiwerdenden Mitteln, in Aus- und Weiterbildung, in F&E sowie in neue Technologien sprechen. Nationale und internationale Infrastrukturprojekte mit hohem volkswirtschaftlichen Wert (z.B. im Rahmen der EU- Erweiterung) sollen allerdings auch beschleunigt werden.
3. Um das Lissabonziel einer 3 % Quote für F&E zu erreichen, muss die steuerliche Förderung für F&E noch abgerundet und die direkte Projektförderung erhöht werden. Insbesondere bei der Projektförderung im Bereich der Auftragsforschung, Kooperationen und außeruniversitären Forschung besteht noch Nachholbedarf. In Österreich liegen die staatlichen Zuschüsse für F&E-Ausgaben im Unternehmenssektor in Relation zu den F&E-Ausgaben insgesamt und zum Bruttosozialprodukt unter dem EU-Durchschnitt. Die F&E-Ausgaben an den Hochschulen und den nicht-universitären Forschungseinrichtungen müssen ebenfalls erhöht werden. Internationale Untersuchungen belegen, dass ein leistungsfähiger öffentlicher F&E-Sektor wichtige Spillover-Effekte für die private Wirtschaft aufweist.
4. Die zweifache Definition der Forschungsausgaben (engere nationale und weitere OECD-Definition) ist unüblich und nicht begründbar[7]. Besser wäre ein einheitlicher Forschungsbegriff bzw. die Abschaffung des Nachweises eines Patents bzw. einer Bescheinigung des volkswirtschaftlichen Wertes. Der erhöhte Forschungsfreibetrag von 35% für Aufwendungen, die den Mittelwert der vergangenen Jahre überschreiten (incremental tax allowance), wird auch in andern Ländern angewendet und soll beibehalten werden. Er sollte jedoch auch auf die erweiterte F&E Definition ausgeweitet werden. Zudem könnten Klein- und Mittelbetriebe -wie in Kanada, Japan und den Niederlanden- stärker steuerlich gefördert werden. Besonders wichtig wäre Fremdforschung (Aufträge an Dritte) in die Förderung einzubeziehen. Die steuerliche Förderung für F&E in Österreich beschränkt sich auf F&E-Ausgaben in Sachkapital. Andere Länder haben eine stärkere steuerliche Förderung für Technologietransfer und F&E-Kooperationen zwischen Firmen und Universitäten. Hier besteht deutlicher Nachholbedarf.

[7] Der umfassendere Forschungsbegriff beruht auf der OECD F&E-Definition („Frascati-Manual"). Der engere Forschungsbegriff umfasst nur volkswirtschaftlich wertvolle (patentierte) Erfindungen.

5. Die Hochschulabsolventenquote am Altersjahrgang der 25- bis 34-jährigen von 15 Prozent muss in den nächsten 10 Jahren stark angehoben werden. Eine Anpassung, zu mindest auf das Niveau der Länder mit einem ähnlichen Bildungssystem wie z.B. Deutschland mit 22 % und die Schweiz mit 26 % ist der nächste Schritt. Alternativ ergibt sich die Notwendigkeit, dass der Bedarf der Wirtschaft durch Zuwanderung von hochqualifizierten, ausländischen Arbeitskräften gedeckt werden müsste.
6. Eine Umschichtung staatlicher Ausgaben von Konsum und Subventionen in Richtung öffentliche Investitionen wäre wachstumsfördernd. Dringend zu prüfen ist, wie wichtige Investitionsprojekte im Bereich Infrastruktur, Gesundheitswesen, Bildung und Wissenschaft trotz der Budgetengpässe forciert werden könnten (z.B. PPP- Modelle, europaweite Finanzierung). Der wirtschaftspolitische Handlungsspielraum wird dabei durch die Kosten einer alternden Gesellschaft und durch den relativ hohen Staatsschuldenstand eingeengt.
7. Besonderer Reformbedarf besteht im Bereich der "freien Berufe", wo noch immer fixe und empfohlene Preise, Werbungsbeschränkungen, Sonderrechte und Gebietsschutz für "geschützte" Gewinne einzelner Berufsgruppen ohne unternehmerisches Risiko zu Lasten des Wirtschaftsstandortes und der Allgemeinheit, sorgen. Falls solche Reformen nur schrittweise möglich sind, gilt es diese umso beständiger voranzutreiben. Die Lockerung/Aufhebung dieser Beschränkungen bietet nicht nur Möglichkeiten und Anreize für die Schaffung neuer Unternehmen in den betroffenen Sektoren selbst. Gerade bei wirtschaftsnahen Dienstleistungen, besteht die Chance, dass durch mehr Wettbewerb das Angebot spezialisierter Beratungsleistungen (z.B. allgemeine Rechtsberatungen, Patentschutz, etc.) ausgeweitet und auch stärker auf spezifische Kundensegmente hin ausdifferenziert wird. Davon könnten gerade Jungunternehmen anderer Wirtschaftszweige profitieren.
8. Kosten und zeitlicher Aufwand für die Gründung einer GmbH sind zu hoch. Verwaltungsvorgänge müssen vereinfacht und die Umstellung auf EDV-gestützte Registrierung vorangetrieben werden. Eine Senkung des einzuzahlenden Stammkapitals für die Neugründung einer GmbH ist zu prüfen. Genehmigungsverfahren für die Gründung eines Unternehmens müssen beschleunigt und die Anzahl bestehender Vorschriften gesenkt werden. Steuererleichterungen für alle privaten Breitband-Internetanschlüsse sollte verlängert und durch eine alternative Prämie ergänzt werden.
9. Höhere Investitionsanreize für private Haushalte und eine stärkere Egalität der Einkommensverteilung können zu einer nachhaltigen Reduktion der Sparquote und zu einer kräftigeren Expansion des privaten Konsums beitragen.
10. Die Stabilisierung der Erwartungen von Investoren und privaten Haushalten sowie ein aktiver Einsatz der Geld- und Fiskalpolitik im Konjunkturtief können wesentliche Beiträge zur Dämpfung der Volatilität der Konjunktur und zu überdurchschnittlichem Wirtschaftswachstum im langfristigen Vergleich leisten.
11. Österreich würde von Infrastrukturprojekten in den neuen EU-Ländern überproportional profitieren. Gelingt es der EU-Wirtschaftspolitik durch gezielte öffentliche Investitionen,

den Aufholprozess der Beitrittsländer zu beschleunigen, so ergeben sich daraus erhebliche Wachstumspotentiale für die heimische Wirtschaft.

1. Determinants of Economic Growth in Austria and in OECD countries

Karl Aiginger and Martin Falk

1.1. Introduction

Raising the rate of economic growth is in general one of the most important economic goals, this is specifically the case in a period of slow growth as Europe experiences since 2000 and for Austria which does not longer enjoy a higher growth rate as compared to other European countries, as it had done up to 1995.

Economic growth in Austria had been higher than in EU average up to 1995. This lead to the position of Austria as one of the five economies with the highest per capita income, giving Austria a lead of more than 10 % versus EU average. Since 1995 growth mirrors approximately that of the EU, income per head and per working force is slightly below EU average. The differential in per capita income therefore narrows a little bit and is now between 9% and 10% (per capita and per workforce respectively), approximately back to the lead in 1990.

In general industrialised countries in the 1990s are characterised by widening disparities of growth rates of GDP per capita (see *OECD*, 2003a, *Aiginger – Landesmann*, 2002). Apart from the US, specifically some smaller EU-countries (e.g. Finland, Sweden and Denmark, we call them top 3 countries following *Aiginger,* 2003) experienced rapid growth of GDP, GDP per capita or employment especially since the mid 90s. What this group of countries appear to have in common is an increase in business enterprise R&D intensity, a rapid diffusion of information and communication technologies and excellence in education and life long learning. High Investment in Information technology, upgrading human capital and innovation are essential to achieving the Lisbon objectives of the European Union in order to become "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion". Other issues of the Lisbon objective include training for entrepreneurship, cheaper and faster start-up, better legislation and regulation, availability of skills and improving online access.

In the empirical literature there is a widespread agreement on the importance of economic policy and institutions for economic growth (*OECD*, 2003a). Many theoretical endogenous growth theories suggest that domestic policy choices are important determinants of national long run growth rates. This literature is explicitly concerned with policies such as investments in education, R&D subsidies, patent protection and tax ratio. Empirical research suggests that a favourable regulatory environment, flexible labour markets and favourable tax and investment climates are important determinants of GDP per capita growth and productivity change (*OECD*, 2003a).

In recent years, a number of OECD countries have implemented a wide range of structural and regulatory reforms. These reforms include deregulation and liberalisation of product markets (particularly telecommunications, utilities and financial services) as well as

privatisation of public enterprises (*Nicoletti* et al., 2001). Despite several years of intense regulatory reforms, the "friendliness" of the regulatory environment towards product market competition still varies substantially across OECD countries. The United Kingdom, Ireland and the United States appear to be the least restrictive overall regulatory environment, while the environment in Italy, Greece and Norway is still characterised by rigid regulations (*Nicoletti* et al. 2001). In the literature, there is universal agreement on the importance of economic policy and institutions for output and Multi-factor productivity growth (*OECD*, 2001a; *OECD*, 2000b). Indeed, recent empirical evidence at the industry level and at the firm level confirms that regulatory and structural reforms in the product market increase MFP growth (OECD 2002; *Scarpetta* et al., 2002; *Nicoletti* et al., 2001; for a concise review see also *Ahn–Hemmings*, 2000). For instance, using a panel data set of OECD countries for the period 1982-1998, *Nicoletti* et al. (2000) find a significantly negative correlation between MFP growth and a general indicator of product market regulation.

Furthermore, there is evidence that the diffusion of information and communication technologies has become increasingly decisive for good productivity and growth performances. Empirical studies for the United States confirm that the diffusion of ICT has strongly contributed to the acceleration of productivity growth during the 1990s (*Jorgenson*, 2001). The contribution of ICT to productivity and GDP growth is found to be less important in the major European countries and Japan (*Colecchia – Schreyer*, 2001; *Daveri*, 2001; Van Ark, *Inklaar – McGuckin*, 2002). Indeed, this may be partly due to the slower speed of ICT diffusion in continental Europe as compared to the United States (*Daveri*, 2000). *McGuckin – Van Ark* (2001) make the point that the diffusion of ICT is also directly connected to regulatory reforms in the product market. Specifically, in European industries, the opportunities to invest in ICT are limited by the restrictive regulatory environment of the product market.

The purpose of this study is to examine the determinants of economic growth in Austria during the period 1980–2002. The growth contribution from standard input factors such as physical investment, human capital and ICT innovations were calculated on the basis of an empirical growth equation. In addition, the growth contribution from the volatility of growth is examined. Using an extended growth model, we also draw attention to the role of the government size and the pace of regulatory reforms in network industries. Furthermore, we use a regression-based decomposition of growth performance.

Moreover, we investigate whether success in economic growth in some smaller EU countries such as Denmark, Finland and Sweden is attributable to their faster accumulation of R&D capital and ICT knowledge as well as to the fast pace of regulatory reforms in these countries. Parallel to this investigation, the study looks at the possible relationship between size of the government and economic growth. This study is a review of Austria's position in terms of important determinants of economic growth. It analyses indicators in order to assess the areas in which improvements are needed to enable Austrian enterprises to compete successfully in the years to come.

The project builds an understanding of the factors that have generated economic growth performance over the past 15 years and identifies the factors driving Austria's future economic growth. In our project, we use a wide range of key input factors from OECD and Eurostat data and the WEF.

1.2. Explaining Differences in Economic Growth among OECD Countries

1.2.1. Introduction

The accumulation of knowledge through research and development and human capital and the application thereof to productive activity is the focus of modern theories of economic growth (see *Romer*, 1990; *Aghion – Howitt*, 1992). According to modern growth theory, it is the accumulation of knowledge rather than the accumulation of physical capital that serves as the engine of long-run economic growth. The accumulation of R&D and human capital does not suffer from diminishing returns. There is a growing and large empirical literature on the determinants of growth. The majority of studies rely on a panel data approach and focus on the impact of innovation and human capital (see inter alia *Bassanini – Scarpetta*, 2001, 2002; *Guellec – van Pottelsberghe*, 2001; *Peneder*, 2003; *Sachverständigenrat* 2002 and *OECD*, 2003a). Using annual data for 21 OECD countries from 1971-1998, *Bassanini – Scarpetta* (2002) find evidence that human capital has a significant impact on growth rates in OECD economies. They conclude that the social return on an additional year of schooling is a six percent increase in steady-state output. Using panel data across 16 OECD countries, *Guellec – van Pottelsberghe* (2003a) explicitly examine the productivity effects of private and public sector R&D. The authors find that the long-run elasticities of total factor productivity with respect to public sector R&D and business sector R&D capital are on average 0.17 and 0.13, respectively. In addition, there are a number of panel data studies on the relationship between government size and economic growth among industrialised countries. *Folster – Henrekson* (2001) examined the growth effects of government spending and taxation in rich countries. Covering the period 1970-1995, the authors find a robust negative relationship between government expenditure and economic growth. In addition, they conclude that a 10 percent increase in government expenditure as a percentage of GDP is associated with a decrease in the economic growth rate by 0.8 percentage points (*Folster – Henrekson*, 2001). Similarly, *Kneller, Bleany – Gemmell* (1999) provide evidence that financial policies can affect long-run growth rates in OECD countries. The authors find that productive expenditures such as expenditures for education and health increase growth, while unproductive expenditures such as social security and welfare have no effect. More recently, *Mueller – Stratmann* (2003) have found a negative effect of government size on economic growth for a sample of industrialised countries.

1.2.2. Growth determinants in the baseline model

Under the steady state assumption growth of the GDP per capita can be expressed as a function of the investment rate, a human capital variable and innovation (proxied by the R&D ratio or patents), population or labour force growth and the initial level of GDP per capita. When deciding to put in policy related variables, it is important to formulate a hypothesis how they affect the growth process as well as in what form they should enter the growth equations. The set of variables that explain economic growth includes a group of baseline variables (those derived from the basic theory) the initial GDP per capita, the share

of investment in GDP, population growth, and human capital and R&D expenditures as percentage of GDP. The variables and the hypothesis are as follows:

Total or private investment: this is the share of physical investment (construction and plant and machinery) in GDP. It is one of the main factors determining the level of real per capita output used in nearly all models. This variable is considered as important determinant of growth, specifically in medium income countries.

Population growth: Growth in population aged 15-64 years.

Human capital: The proxy measure used here is average years of education among the working age population (from 25 to 64 years of age) (see De la *Fuente – Domench*, 2000). This indicator has also been employed by *Bassani – Scarpetta* (2001) and Islam (1995). It is well known that this variable is a weak indicator of human capital because it can not account for differences in the quality of education (see *Wößmann*, 2003). The impact of average years of schooling is expected to be positive but not always significant.

Expenditures on Research and development: R&D plays an important role in increasing productivity and growth. The strength between R&D and growth is of particular policy relevance. Governments are actively engaged in the promotion of R&D though direct funding of private R&D, tax incentives for private R&D and public sector R&D. Here we look at the effects of public sector R&D and R&D expenditures of higher educations institutes. Overall, the expected effect of private and public sector R&D is positive, yet it remains unclear whether the impact is similar to private R&D. On the one hand, there are reasons to suppose that public R&D expenditures might be less productive at the margin if misdirected according to political, rent-seeking objectives. On the other hand, there are reasons for a higher productivity of public R&D expenditures because the higher education sector concentrates more on basic research known to generate more externalities (*Guellec – Van Pottelsberghe*, 2003b).

1.2.3. Growth determinants in the extended model

The extended growth equation includes additionally the following explanatory variables:

Indicator on regulatory reforms in network industries: The regulatory reform indicator measures on a scale from 0 to 6 (from least to most restrictive) restrictions on competition and private governance. The summary index of regulation includes information on entry barriers, public ownership, the market share of new entrants (in the telephone, gas and railroad sectors), and price controls, e. g. in the road freight industry (*Nicoletti* et al., 2001). Reforms that associated with a reduction in entry barriers and/or in the mark-ups tend to lead to an increase in investment and thus in economic growth.

Patent applications: Patents per resident is an indicator of the output of the innovations process. Here we distinguish between EPO biotechnology patent applications and EPO ICT patent applications. ICT patents may reflect the differences in ICT diffusion in continental Europe as compared to the United States and the Nordic countries. The expected effect of patents is positive.

Volatility of growth: Theoretically, the effect of the volatility could be positive or negative. On the one hand the relationship could be negative as volatility could deter the accumulation

of physical and human capita. On the other hand the relationship could be positive as volatility could be a manifestation of the adoption of a new purpose technology (*Imbs*, 2002). Empirically, the sign of the relationship between growth and volatility remains inconclusive. For example, there are a number of studies based on cross-country or cross-regional comparisons in which the correlation between the average growth of output and the variability of output growth is found sometimes to be positive (c.f *Imbs*, 2002) and sometimes to be negative (e.g., *Martin – Rogers* 2000; *Ramey – Ramey 1995*).

Public investment: Public investment is recognized as an important factor of economic growth (*Aschauer*, 1989). Public investment includes investment in transportation, communication equipment and in infrastructure. Therefore, it is important to distinguish between public and private investment. The expected effect of public investment is positive though the impact of government investment should be lower than private investment. However, on the one hand, there are reasons to suppose, that public investment might be less productive at the margin if it is misdirected according to political, rent-seeking objectives. On the other hand, to the extent that market investment in infrastructure is sub-optimal due to co-ordination problems or free-rider problems, public investment might be more productive.

Government expenditures and taxes: In theory the relationship between government expenditures and economic growth is ambiguous. New growth models conclude that fiscal policy can increase the steady-state economic growth rate, if policies aim at influencing the quantity and/or quality of the capital stock (see *Barro*, 1990). In general, growth effects of fiscal policy can be divided into productive and non-productive expenditures, and distortionary and non-distortionary taxes (*Kneller, et al.* 1999). Productive expenditures and non-distortionary taxes stimulate growth due to crowding-in effects, whereas non- productive expenditures and distortionary taxes reduce growth due to crowding out effects. It is generally assumed that public investment in infrastructure, education and health belong to productive government expenditures (*Kneller et al.* 1999). Examples of non-productive government expenditures are subsidies to state-owned enterprises.

Government consumption: The impact is expected to be negative. As government consumption increases as a percentage of GDP, investors modify their investment plans because of an anticipated increase in tax rates to cover the increased government consumption spending.

Government consumption on wages: Expenditures on salaries of public servants are often regarded as non-productive. The main channel through expenditure on government wages influences private investment negatively is through the pressure it puts on raising wages in the private sector.

Government budget deficits and debts: In general, budget deficits are assumed to have a negative impact on long-run growth. These effects could be non-linear, in which case there may be important threshold levels to identify. Determining nonlinearities in the impact of budget deficit and debts is beyond the scope of the study. Higher debts or deficits increases real interest rates and, thus, crowds out private investment expenditure and adversely affects economic growth and employment. Borrowing will also lead to higher future taxes. This may

further discourage private investment. Moreover, higher budget deficits may increase risk premiums on interest rates, in particular raising the inflation risk and the default risk premium. Higher interest rate risk premiums may discourage private investment (*Alesina – Perotti,* 1997).

Subsidies: this variable is defined as subsidies relative to GDP. It is dominated by subsidies to agriculture, to manufacturing and railroads. The impact of subsidies is expected to be negative.

Social Security contribution: The standard argument is that increases in social security contributions lead to higher labour costs. Such a rise of wages will depress profitability of private investment (*Alesina et al.,* 1999). In addition, there are negative effects due to their distortionary effects on labour market participation.

Ratio of direct to indirect taxes: Direct taxes are a better tool to improve income distribution: those who earn more pay more. Indirect taxes are regressive since poorer groups pay a higher percentage of their income. The expected sign is negative.

Inflation is expected to be negative. The main arguments for a negative impact of inflation include (i) generation of uncertainty, (ii) relative price distortions (see *Ahn – Hemmings* 2000).

All equations are estimated using GMM with t-values and test statistics that are asymptotically robust to general heteroscedasticity. Since all variables except budget deficit and indicator for regulatory reform are measured as first (=five year) differences in natural logarithms, the coefficients can be interpreted as medium-run elasticities. Long run elasticities can be obtained when the coefficients are divided by 1 minus the coefficient of the lagged endogenous variable.

1.2.4. Empirical results of the baseline growth equation

The main results of the standard growth equation with human capital and R&D are as follows.

In all regressions, R&D ratio measured as BERD as a percentage of GDP, lagged GDP per capita and the investment rate enter positively and are significant in most of the cases [8](see Table 1.23) This is consistent with earlier studies in the literature.

Moreover, in the majority of equations estimated, human capital exhibits the correct positive sign. However, few of those with the correct sign show statistical significance. The poor performance of average years of schooling as a measure of human capital could be due largely to the fact that the difference in educational quality is not captured.

Looking at the technology and regulatory indicators we find that both EPO ICT patent applications as a percentage of total EPO patents and the indicator of regulatory reforms are associated with higher GDP growth when entered separately. We do not find significant effects of EPO patent applications per population and EPO biotechnology patent applications as a percentage of total EPO patents.

The results of standard growth equation with additional technology indicators when combined into a single model are presented in Table 1.26. In Model 1 we include EPO patent applications per population as an additional variable. Model 1 is essentially the same as

[8] For this result see table 1.23; all the model results are replicated in the appendix, tables 1.23ff

Model 2 except that EPO patent applications are replaced by EPO ICT patent applications as a percentage of total EPO patent applications. In model 3 and 4 we disaggregate R&D expenditures by performing sector: R&D (HERD), % GDP and government expenditures on R&D, % GDP. Again, all of coefficients have the expected sign except government expenditures on R&D. Lagged GDP per capita is significant at the 1% level in all regressions. The corresponding estimated value of adjustment coefficient range between 0.16 (=1-0.84) and 0.30 (=1-0.70), which implies that between 16% and 30 % of the adjustment takes place within five years. The specific novel finding is that ICT patents enter the growth regression with positive sign at the 1 % level (see Table 1.26, model 2). This means that ICT patents are associated with a higher long-run GDP growth. This is also consistent with the observation that countries who were "early adopters of ICT" experienced a higher GDP growth. Furthermore, we find that a lower valued regulatory indicator (=increased deregulation) raises GDP per capita. The R&D/GDP ratio turns out significant implying that increasing R&D activities have a significant positive impact on GDP per capita growth. The long-run elasticity of R&D intensity with respect to GDP per capita is about 0.20 (=0.06/0.30 based on the second specification).

When interpreting the coefficients on higher education expenditures on R&D as percentage of GDP one has take into account the high collinearity between both types of R&D expenditures (the correlation is 0.82). Average years of schooling is correctly signed and but in some cases not significant at the five percent level. However, the coefficient on average years of schooling is highly sensitive to the exclusion of the regulatory reform indicator. Investment rate is also significant at the 1 % level in all regressions. This is consistent with Sala-i-Martin (1997) who finds that the level of investment in equipment is one of the strongest correlates of economic growth.

1.2.5. Empirical results of the extended growth equation

Table 1.27 reports the results for the impact of volatility of growth rates. The first two columns have the results for model with period dummies whereas the next two columns report the results excluding period dummies. The impact of the volatility of growth rates on growth of GDP per capita is negative and significant indicating that countries with higher volatility have lower mean growth. Note that the volatility of growth rates is introduced into the model by measuring it in levels rather than first differences.

Furthermore we report the results of the impact of the composition of government expenditure and government revenues. Again we start by discussing whether the additional indictors of government size are statistically significant coefficients when entered individually. We find that indicators of government size are significantly negative in most of the cases indicating that government size is associated with a lower long-run GDP growth. In particular we find that gross government debt as a percentage of GDP, employment in the government sector as a percentage of total employment, total government consumption as a percentage of GDP, social security contributions as a percentage of GDP, subsidies as a percentage of GDP, taxes and social security contributions as a percentage of GDP, and primary deficit as a percentage of GDP are all significantly negative at the 1 % level. When we divide total government consumption into government consumption excluding wages and non-wage government consumption, we also find a negative effect of both subgroups

but the effect of government consumption excluding wages is not significant. Indirect taxes as a percentage of GDP also have a negative sign, but they are only significant at the 6 % level. In contrast we do not find a significant effect of direct taxes on GDP. Interestingly we do not find a significant relationship between the tax ratio and GDP per capita. The tax distribution (ratio of direct to indirect taxes) is positively related to GDP per capita (see Table 1.24 in appendix).

It is well known that there might be two-way causality between indicators of government size and growth. For this reason we treat the indicators of government size as endogenous and re-estimate the growth equation using all available further lags. Unreported results show that allowing for endogeneity of the variables of government size in the growth equation makes relatively little difference to the estimated coefficients. However it could be hypothesized that there was a nonlinear relationship between indictors of government size and growth. The failure to control for the nonlinear relationship in regular regression can lead to wrong conclusions about the effect of the independent variable. Determining nonlinearities is beyond the scope of the study.

Table 1.28, Table 1.29 and Table 1.30 in appendix report the results of standard growth equation augmented by measures of the size of the government when introduced simultaneously. The results of Table 1.28 in appendix suggest a positive and statistically significant effect of both private and government investment (see column 1). As expected, the coefficient estimated for private investment as a percentage of GDP is higher than the coefficient for fixed government investment as a percentage of GDP. Moreover, in all three models estimated, government consumption exhibits a negative sign and show statistical significance. Furthermore, the negative effect of government consumption holds when it is disaggregated into government consumption on wages and non-wages (see Table 1.28, column 2 appendix). In model 3 we include an indicator of 'unproductive" government activity, subsidies as a percentage of GDP. Both total government consumption and subsidies are significantly negative related to GDP growth.

Table 1.29 appendix shows the results of the growth equation when government size is disaggregated by source of revenue. The overall tax burden, the share of social security contributions and budget deficit all have a significantly negative effect on GDP per capita (see column 1). Furthermore, there seems to be no additional effect coming from the tax distribution variable (the ratio of direct to indirect tax receipts) (see column 2). In column 2 we divide taxes into two categories, direct and indirect. The effect of indirect taxes is significantly negative, while indirect taxes do not have a significant impact on GDP.

The inclusion of both revenue and expenditure categories in the equation is based on the notion that the size of government is limited by the need to finance such spending through taxes. In fact, often an increase in government spending is financed by an increase in taxes. Such a policy can be modelled as a simultaneous increase in government spending and taxes. Taking into account the possible interactions between expenditures government expenditures, deficits and taxes we re-estimate the growth equation with both different types of government expenditures and revenues. We find that the both budget deficit and government consumption are significantly negative in all the three specifications, regardless whether the tax ratio or social security contributions are included (see Table 1.30 in

appendix). However, there is some collinearity among these measures of government size, which may account for the low t-statistics obtained when the measures are included jointly. Note also that total government consumption has been taken as proxy variable of total size of government but it does not mean that certain types of government spending such as educational and health expenditures are not helpful. Total taxes come out as not statistically significant when government consumption is included.

1.3. Evolution of GDP and input factors in Austria and the European Union

1.3.1. GDP per capita

GDP per head measured at ppp rates is usually taken as the best indicator of living standards. GDP per head in 2002 for Austria has the same level as the Top 3 countries Denmark, Finland and Sweden at around 10 percent above the EU average (see Table 1.1). Our relative position amongst the EU countries remained unchanged since the early 90s. In contrast the relative position of the Nordic countries has improved slightly during this period. Looking at the growth of real GDP per head over the 70s and 80s, Austria's average growth rate was higher than that of the EU-15. However, in the 90s Austria grew at a similar rate. In the 90s the pattern of economic growth has been uneven.

Table 1.1: Evolution of GDP per capita at constant ppp rates

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002
	GDP per capita in constant $ ppp rates				
Austria	107.3	106.8	110.6	110.9	110.3
European Union EU-15	100.0	100.0	100.0	100.0	100.0
Top 3	112.3	113.4	106.3	107.5	109.7
United States	138.3	140.9	141.0	146.1	143.0
	GDP per working age population in constant $ ppp rates				
Austria	106.2	105.4	109.5	110.1	108.6
European Union EU-15	100.0	100.0	100.0	100.0	100.0
Top 3	111.3	113.6	107.8	109.4	111.2
United States	121.3	124.5	124.5	128.6	125.4

Source: OECD economic outlook, own calculations.

Table 1.2: Actual GDP per capita growth in the OECD area, by sub-period

	1970-00	1970-80	1980-90	1990-00	1996-00	1996-03	2000	2001	2002	2003
United States	2.2	2.1	2.2	2.2	3.3	1.7	3.2	-3.3	1.4	1.2
Japan	2.6	3.3	3.5	1.1	0.5	0.8	1.4	0.1	0.0	3.0
Germany	..	..	..	1.3	2.0	1.4	2.9	0.6	-0.1	0.2
western Germany	1.5	2.6	2.0	..	..	..	..			
France	2.0	2.7	1.8	1.4	2.6	1.9	2.9	1.6	1.0	-0.4
Italy	2.2	3.1	2.2	1.4	1.9	1.5	2.7	1.4	0.2	0.8
United Kingdom	2.1	1.8	2.5	1.9	2.4	2.3	2.4	1.8	1.2	1.4
Austria	2.5	3.5	2.1	1.8	2.6	1.8	2.8	0.5	1.1	0.3
Belgium	2.3	3.2	2.0	1.8	3.0	1.9	3.8	0.3	0.9	0.6
Denmark	1.9	1.8	1.9	2.0	2.4	1.8	2.9	1.1	1.8	0.4
Finland	2.5	3.1	2.7	1.8	5.0	3.2	5.5	1.0	1.9	0.8
Greece	1.9	3.6	0.2	1.9	3.5	3.6	4.1	3.8	3.4	4.2
Ireland	4.3	3.3	3.3	6.4	9.2	6.7	10.2	4.8	5.3	0.7
Luxembourg	3.4	1.9	3.9	4.5	5.7	4.0	6.0	0.3	1.0	0.8
Netherlands	2.0	2.1	1.6	2.2	3.2	1.7	2.7	0.8	-0.5	-1.0
Portugal	3.0	3.4	3.1	2.5	3.2	1.9	3.1	0.9	-0.4	-1.1
Spain	2.5	2.5	2.6	2.5	4.0	2.9	4.0	2.0	1.3	1.8
Sweden	1.6	1.6	1.9	1.4	3.2	2.5	3.4	0.9	1.6	0.8
EU 15 (aggregate)	2.1	2.5	2.1	1.6	2.8	2.0	3.3	1.3	0.7	0.6
EU 15 (mean)	2.4	2.8	2.2	2.3	3.5	2.6	3.8	1.4	1.3	0.6
EU top 3 (mean)	2.0	2.2	2.1	1.7	3.6	2.5	3.9	1.0	1.8	0.7

Notes: Total economy, percentage change at annual rate.

Source: 1970-2000: OECD (2003); 2001-2003: OECD Economic outlook database, own calculations.

1.3.2. Total private and public investment

Private and public investment is important for economic growth. Investment in machinery and structures make workers more productive and is a way of embodying new technology in the production process. The overall investment demand depends on a number of factors such as user costs of capital (including tax incentives), overall demand, and macroeconomic factors.

Austria used to have a very high investment ratio. In contrast, the average investment ratio in EU top 3 and the European Union are about 5 respectively 3 percentage points lower in the first half of the nineties. The investment ratio in Austria decreased from 23.7% in 1990/1994 (mean value) to 22.9% in 2000/2002 (mean value), compared with 20.8% and 21.2% in the EU 15 (country mean) indicating that Austria is converging to EU average but it is still 1.7 percentage above the EU mean and 3.6 above the top 3 countries.

There are many types of public investment: transport, roads, railways, health, defence, education, housing & community amenities and public order & safety. In Austria, total gross public investment as a percentage of GDP has fallen almost continuously since the mid-1970s

comprised 5.5% of GDP in 1975 and fell to 1.1% in 2002. The decline was therefore 4.3 percentage points of GDP. One explanation for the decline in public investment is that private companies may increasingly undertaken investment on behalf of the government indicating that the split between public and private investment is becoming problematic. This seems to be the case in Austria in 1997 following the privatisation wave (see Clemens 1999). In 1997 the decrease in the ratio of public investment to GDP of about 0.9 percentage point tends to be accompanied by rising private investment ratio of about 1.1 percentage points. Therefore we correct for this shift.

Table1.3: Private and public Investment

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002	change 1980/1984-2000/2002	change 1990/1994-2000/2002
	Total investment, % GDP						
Austria	23.4	22.7	23.7	23.4	22.9	-0.1	-0.4
EU (mean)	22.7	21.7	20.8	20.3	21.2	-0.3	0.2
EU Top 3 (mean)	22.4	23.8	19.7	18.1	19.3	-0.7	-0.2
United States	20.3	19.9	17.5	19.2	19.6	-0.2	1.2
	Private investment, % GDP						
Austria	20.4	20.1	20.7	21.1	21.5		
Austria (corrected)	20.4	20.1	20.7	20.5	20.5	0.0	-0.1
EU (mean)	20.0	19.3	18.1	17.4	17.9	-0.6	-0.1
EU Top 3 (mean)	20.9	22.0	17.3	15.6	16.5	-1.2	-0.6
United States	18.1	16.9	14.5	15.8	15.4	-0.8	0.7
	Government Investment, % GDP						
Austria	4.0	3.4	3.2	2.3	1.3		
Austria (corrected)	4.0	3.4	3.2	2.7	1.7	-4.4	-6.7
EU (country mean)	3.4	3.0	2.9	2.7	2.7	-1.4	-1.2
EU Top 3 (mean)	3.3	2.9	2.8	2.7	2.5	-1.5	-1.2
United States	3.5	3.8	3.5	3.2	3.3	-0.3	-0.6

Source: OECD economic outlook. Private and public investment do not sum due total investment.

1.3.3. Investment in research and development

Research and development activities lead to new products, processes and services and thereby to higher value added. Research and development activities are performed primarily by three sectors: business, institutions of higher learning (primarily universities) and government institutions. Table 1.4 shows that Austria's position in research and development spending improved significantly in the 1990s. In Austria, total expenditures on R&D amounts to 2.2% in 2000/2002 which is similar to the EU average. Looking at R&D by performing sector we find that R&D performed by the business and the higher education sector (HERD) increased steadily relative to GDP over the 1990s. The ratio of business R&D to GDP reached 1.3 % for the period 2000/2002 compared to 0.8 % for the period 1990/1994. While Austria lags significantly behind the EU Top 3 (2.5 %) in terms of spending on business sector R&D as a percentage of GDP, the gap between Austria and EU-15 average has closed. Countries that

have the highest percentage gains in R&D intensity tended to be those with already high levels of R&D such as Finland and Sweden. This leads to a widening gap in BERD as a percentage of GDP between Austria and EU 3 in the 1990s. Furthermore, there is a smaller gap between Austria and EU Top 3 regarding public sector expenditures on R&D (including the government and higher education sector). The GDP share of public sector expenditures on R&D for Austria and EU top 3 are 0.6 % and 0.9% respectively (see Table 1.4).

Given the significance of business R&D as a key component of all R&D activities, it is worth asking about the trends in government support for business enterprise R&D (BERD). Government support for R&D spending includes direct R&D subsidies and fiscal incentives for R&D. Looking at direct subsidies one can observe that funding from government is a small component of total business R&D expenditures. The direct funding of business R&D is proportionally lower in Austria compared to the European Union and EU top 3. Funding from government sources for business R&D accounted only of 0.07 % of GDP in Austria and 0.08 % in the European Union. In the European Union, the ratio of government-funded BERD to GDP has constantly decreased during the period 1981-2002, especially during the first half of the 1990s. Policies that directly target R&D also include tax incentives for R&D. The generosity of a country's tax arrangements for supporting R&D can be measured by the B-index (Warda 2002). Table 1.4 shows that Austria's tax system is relatively favourable compared to EU average. Furthermore, in Austria the generosity of tax credits for R&D increased during the period 1995-2002. There is a similar tendency in EU 15 (average) but not in EU top 3.

The reforms of the tax incentives are as follows:

- Companies may now deduct 25% of their R&D expenditures from their profit-before-tax statements, where the definition of the R&D expenditure item follows the OECD Frascati Manual.
- Alternatively, a tax allowance is granted for "economic useful inventions". In this setting the tax allowance is again 25% of R&D expenditures and in addition expenditures exceeding the average annual level of the last three years are deductible with a rate of 35%.
- If firms are not profitable they can draw on an R&D premium of 8% of R&D spending as defined by the OECD Frascati Manual. This R&D premium is the post tax equivalent of the 25% tax allowance.

It is interesting to note that Sweden and Finland do not have substantial indirect funding, although these countries have high levels of private business enterprise expenditures. One explanation of the rapid accumulation of R&D is the active technology policy of the Finish government (see Aiginger, 2003). In the early eighties the Finns came to realise the strategic importance of research and development as a requirement for the country's economy. A milestone was the establishment of Tekes in 1983, which is a government agency providing financing and expert services for R&D in Finland. Complementary institutions supporting cooperative networks, training, and the exploitation of inventions were created. Start up companies and internationalization were encouraged, venture capital provided.

Table 1.4: R&D expenditures by performing sector and government support for R&D

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002	%-change p. a 1980/1984-2000/2002	%-change p a. 1990/1994-2000/2002
	Total expenditures on R&D, % GDP						
Austria	1.1	1.3	1.5	1.7	2.0	3.1	3.6
EU 14 (mean)	1.3	1.5	1.6	1.8	2.0	2.7	2.2
EU Top 3 (mean)	1.5	1.9	2.2	2.7	3.4	4.3	4.7
United States	2.5	2.7	2.6	2.6	2.8	0.6	0.8
	business R&D spending, % GDP						
Austria	0.6	0.7	0.8	1.1	1.3	3.8	5.3
EU 14 (mean)	0.8	0.9	1.0	1.1	1.3	3.4	3.2
EU Top 3 (mean)	0.9	1.2	1.4	1.9	2.5	5.7	6.5
United States	1.8	2.0	1.9	1.9	2.0	0.5	0.7
	government financed business R&D spending, % GDP						
Austria	0.05	0.05	0.08	0.06	0.07	2.1	-1.5
EU 14 (mean)	0.12	0.12	0.10	0.08	0.08	0.8	-1.9
EU Top 3 (mean)	0.09	0.11	0.12	0.12	0.11	1.8	-1.1
United States	0.56	0.61	0.40	0.29	0.19	-5.5	-7.9
	higher education sector expenditures on R&D, % GDP						
Austria	0.4	0.4	0.5	0.5	0.6	2.8	2.3
EU 14 (mean)	0.3	0.3	0.4	0.4	0.4	3.4	2.0
EU Top 3 (mean)	0.4	0.5	0.5	0.6	0.6	2.4	2.2
United States	0.3	0.4	0.4	0.4	0.4	1.2	0.3
	Government sector expenditures on R&D, % GDP						
Austria	0.1	0.1	0.1	0.1	0.1	0.5	-1.8
EU 14 (mean)	0.2	0.2	0.2	0.2	0.2	-0.6	-1.5
EU Top 3 (mean)	0.2	0.2	0.3	0.3	0.3	0.7	-0.7
United States	0.3	0.4	0.4	0.4	0.4	1.2	0.3
	generosity of the tax treatment of R&D (large firms)						
Austria	0.95	0.99	0.94	0.91	0.88	-0.4	-0.8
EU 14 (mean)	0.99	0.99	0.98	0.95	0.92	-0.4	-0.8
EU Top 3 (mean)	0.99	1.02	1.01	0.96	0.97	-0.1	-0.5
United States	0.82	0.87	0.93	0.95	0.93	0.7	0.1

Source: OECD MSTI 2003; B-index unpublished data.

The next area identified as a key element of promoting business R&D are property rights, university industry research collaboration and quality of scientific research institutions. The World economic forum regularly surveys international firms to these indicators. Table1.5 shows that Austria performs relatively well in this respect. With respect to the quality of scientific research institutions Austria's score of 5.3 places it above the EU level. Austria also performs reasonably well with respect to university research collaboration with a score of 4.8 ranked above the EU 15 level but behind the three top EU countries.

From the six possible fiscal R&D incentives included in the evaluation, namely tax incentives for business R&D expenditure, for R&D capital expenditure, technology transfer, the contracting of researchers, the cooperation between firms and research institutes/universities and the creation of innovative firms, Austria provides a tax incentive only for R&D capital expenditure (see European Commission 2002).

Table1.5: Other indicators on R&D

	1997-1999	2000-2003
	Quality of scientific research institutions	
Austria	4.9	5.3
EU15	4.8	5.2
EU3	5.4	5.7
	Intellectual property protection	
Austria	6.0	6.2
EU15	5.6	5.6
EU3	6.0	6.1
	University & industry research colloboration	
Austria	4.7	4.8
EU15	4.5	4.6
EU3	5.2	5.2

Notes: Maximum score is 7.

1.3.4. Investment in information and communication technologies

Investment and innovations in information and communication technologies (ICTs) are one of the main engines of long-run economic growth. In particular, the development of ICTs has led to their wide diffusion and application such as the development of the internet and with it e-business activities. Digital technologies and its infrastructure such as broadband are a key enable of a modern knowledge driven economy.

Indicators available for this area are investment in ICT equipment and software, expenditure on ICT goods and services, and ICT patents, measures of the access to information technologies such as access to telecommunication networks, Internet infrastructure and the price of Internet access. In addition, the share of the ICT producing sector and the use of information technologies by businesses and households can be employed. In this study we use the ICT patents and ICT investment as proxy variables for ICT diffusion. The pattern of ICT diffusion in Austria has been different from that in the EU top 3 countries. In the 80s, Austria started from a higher level than Denmark, Finland and Sweden but experienced a lower growth rate than that of EU average and EU top 3 countries. Denmark, Finland and Sweden are characterised by a very strong growth of the ICT investment ratio that even accelerated in the 1990s. In contrast, Austria experienced a deceleration in the growth rate of ICT investment share in the 1990s. Because of continuous growth of ICT investment in EU 15 and EU 3, no signs of catch up by Austria can be found in the 1990s. Another indicator of the diffusion of ICT is innovation in information and communication technology measured as Information and communication technology (ICT) patents as a share of total national patents filed at European Patent Office (EPO). ICT patents included patents from any of the following

classes of the International Patent Classification (IPC): computing, calculating and counting (G06); information storage (G11); and electric communication technique (H04). Austria is relatively weak in this field. In 2000, ICT patents accounted for 18% of total patents. The corresponding share of EU Top 3 and the European Union are 29% and 28 %, respectively. Among the EU countries Finland, Netherlands and Ireland have the highest share of ICT patents. This clearly shows the comparative advantage in ICT innovative activities in these countries. The share of ICT patents filed at EPO has increased rapidly for most EU countries in the 1990s. During the 1990's ICT patents share grew at an average annual rate of 4.5%. However, ICT patents have increased much more rapidly in Denmark, Sweden and Finland than in the European Union. Austria had a 2% growth in the share of ICT patents per year in 1990-2000.

Table 1.6: Investment and innovation in information and communication technology

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002	change 1980/2000	change 1990/2000
	ICT investment as a share of total non-residential investment						
Austria	7.1	9.6	10.0	10.4	12.8	3.0	2.5
EU	7.1	11.6	12.2	14.1	17.1	4.5	3.4
EU Top 3	5.1	7.7	9.3	15.4	19.4	6.9	7.7
United States	15.5	21.3	22.8	25.6	29.6	3.3	2.6
	Share of EPO ICT patents in total patents						
Austria	8.5	10.4	12.7	15.5	17.9	4.9	3.0
EU (country mean)	13.4	15.3	18.6	23.1	27.7	4.0	4.5
EU Top 3	14.4	13.8	21.4	33.4	39.1	4.5	8.8
United States	27.0	29.6	32.2	35.6	38.8	2.2	2.0

Source: Van Ark et al. 2002, OECD MSTI 2003.

Digital subscriber lines (DSL), cable modems and other broadband connections are an important indicator of broadband penetration, as they can carry telephony as well as large amounts of data. In Austria broadband has diffused most widely than in EU (Table 1.7).

Table 1.7: Broadband access per 100 inhabitants

	DSL lines and cable modem					DSL+cable platforms	+other
	1999	2000	2001	2002	2003	2002	
Austria	0.6	1.7	3.6	6.3	7.0	9.9	
EU 15	0.1	0.5	1.6	3.4	4.4	5.1	
Top EU 3	0.1	1.0	3.3	6.7	8.2	10.4	
United States	0.6	2.2	3.9	6.2	7.5	10.6	

Source: www.sourceoecd.org and OECD STI indicators.

Increased competition in the telecommunications industry has been driving down the cost of Internet access and the costs of least lines. In Austria the charges for leased lines are lower than that of the OECD average but higher than in the Nordic countries (Table1. 8). Internet access prices have decreased considerably in all EU countries. In 1998, Austria's Internet access costs were among the highest in the EU (measured in prices in US Dollars at Purchasing

Power Parity). However, in 2002 Austria is one of the cheapest places in the EU for daytime internet access - for 20 hours a month access (Table 1.9). These pricing changes reflect the high level of competition in Austria. There is no direct link between Internet access and cost. For example, Denmark, Finland and Sweden, where Internet connections at home are common, are not among the countries with the lowest cost.

Table1. 8: Price of national leased lines and Internet subscribers

	Price of national leased lines, OECD=100	Internet subscribers per 100 inhabitants		Level of Internet access households
	2002	1999	2001	2002
Austria	65.7	6.0	20.6	30.9
EU 15	61.1	9.5	17.0	38.9
Top EU 3	20.8	17.8	29.4	54.7
United States	62.0	18.2	27.2	50.5

Notes: Charges for a basket of national leased lines of 2 megabits per second.

Source: OECD STI scoreboard 2003. Source: OECD, Telecommunications database, March 2003.

Table 1.9: OECD Internet access costs including VAT, in USD PPP

	20 hours using discounted PSTN rates, daytime					
	1998	1999	2000	2001	2002	change
Austria	100	80	45	46	30	-25.8
EU-15	64	59	42	44	44	-8.9
EU-3	43	41	32	32	33	-6.9
United States	40	35	33	34	34	-4.1
	20 hours using discounted PSTN rates, evening					
	1998	1999	2000	2001	2002	
Austria	64	49	32	33	30	-17.1
EU-15	47	41	32	32	33	-8.3
EU-3	29	30	27	26	28	-1.1
United States	40	35	33	34	34	-4.1
	40 hours using discounted PSTN rates, daytime					
	1998	1999	2000	2001	2002	
Austria		128	71	73	47	-28.6
EU-15		96	66	69	66	-11.6
EU-3		66	49	52	53	-7.4
United States		37	24	36	36	-1.3
	40 hours using discounted PSTN rates, evening					
	1998	1999	2000	2001	2002	
Austria		65	46	46	44	-11.9
EU-15		61	44	46	46	-8.7
EU-3		39	38	40	44	3.6
United States		37	24	36	36	-1.3

Source: OECD, Communications Outlook 2003.

1.3.5. Investment in human resources

The importance of an education system that matches the needs of the knowledge economy has long been appreciated by governments and policy makers. Higher skills allow workers to generate new ideas and to effectively introduce new technology or organisational changes. Human capital can be developed through the educational system and also through on informal and formal training during working life. Measures of educational attainment are most commonly used proxies for human capital. However, they do not cover quality of schooling and formal or on the job training. Austria has a roughly good position in the total education level. Austria's 'stock' of education measured as average years of schooling is above the EU average and similar to EU top 3 (see Table 1.10). The good position is due to the very high share of vocational and apprenticeship training in secondary education compared to other countries and this compensate for the relatively low share of population with tertiary education. In Austria 15% of the population aged 25-34-has attained tertiary education. The share of population with university level is 34% in EU Top 3 and 29 % in the European Union (country means) (see Table 1.11). Austria also performs quite poorly in terms of tertiary graduates in science and technology per 1 000 of population (see Table 1.12). A similar position can be found in terms of upper secondary rates/university entrance degree (see Table 1.14).

However, it is well known that the distinction between tertiary qualifications Type B and post secondary non-tertiary programme is not clear-cut. Therefore, we also look at the combined shares of tertiary qualifications and post secondary non-tertiary programmes. If one adds the share of population that completed a post secondary non-tertiary programme, the share would rise to 35 % (OECD, 2003b).

Expenditures on tertiary education as a percentage of GDP are about 1.4% and slightly lower than that of the Top 3 countries. However, the share of population at typical age of graduation with tertiary education is about twice as much in the top 3 countries than in Austria (Figure 1.1). These differences might be associated to the long average duration of tertiary studies in Austria compared with other countries (OECD, 2003b).

In Austria the percentage of tertiary expenditures education declined between 1995 and 2000. As a result, tertiary expenditures on education per student are declining rapidly given the rapid increase of tertiary students during the period. The average duration of studies is one third longer in Austria than in the EU average (6.2 years in Austria compared with 4.7 years in the EU (country average). As a consequence the cumulative expenditures for each tertiary student are 50 % higher in Austria than in the EU (see Table 1.13).

Skills cannot be measured solely with formal education. When looking at the percentage of 25-64 year olds persons in continuing education and training we observe that Austria is below the EU average (see Table 1.15).

Table 1.10: Average years of schooling

	1980- -1984	1985- -1989	1990- -1994	1995- -1999	2000- -2002	change 1980/2000	1990-2000
Austria	10	11	11	12	12	0.86	0.77
EU14	9	10	10	10	11	0.92	0.88
EU3	10	11	11	11	12	0.64	0.55
United States	12	12	13	13	13	0.37	0.33

Notes: EU 14: Luxembourg is excluded.

Table 1.11: Trends in educational attainment at tertiary level at the typical age of graduation

	females &males			males			females		
	1990- 1994	1995- 1999	2000- 2002	1990- 1994	1995- 1999	2000- 2002	1990- 1994	1995- 1999	2000- 2002
Austria	8	11	15	8	11	15	8	11	14
EU15 (means)	22	25	29	21	24	27	23	26	30
EU3 (means)	29	31	34	27	29	29	32	34	39
United States	31	36	39	30	34	36	32	37	41

Notes: Classification of tertiary programmes in Austria includes: Fachhochschul- und Universitätsabsolventen, Lehramtsabschluss, Meister, Akademisch geprüfte Absolventen.

Source: OECD at a glance 2003.

Table 1.12: Tertiary graduates in science and technology per 1 000 of population aged 20-29 years

	1995-1999	2000-2002
Austria	7.4	7.3
EU 15 (mean)	9.8	11.2
EU-15	n.a	9.3
Top EU 3	10.7	13.5
United States	11.4	n.a

Source: Structural indicators.

Table 1.13: Tertiary Expenditures, duration of studies and cumulative expenditures per student

	Tertiary expenditures, % GDP		Average duration of tertiary studies (in years)			Cumulative expenditure per student
			All	Tertiary-type B	Tertiary-type A	All
	1995	2000	2000	2000	2000	2000
Austria	1.35	1.21	6.2	2.5	7.3	66948
EU-13	1.23	1.23	4.7			44860
EU-3	1.72	1.65	4.9			56743

Source: OECD at a glance 2003.

Table 1.14: Upper secondary rates (2001)

	ISCED 3A	ISCED 4A	ISCED 3A & 4A
Austria	16	20	36
EU 15	53		56
EU top 3	72		72

Notes: ISCED 3A: designed to prepare for direct entry to tertiary-type A education. ISCED 4A: designed to prepare for direct entry to tertiary-type A education.

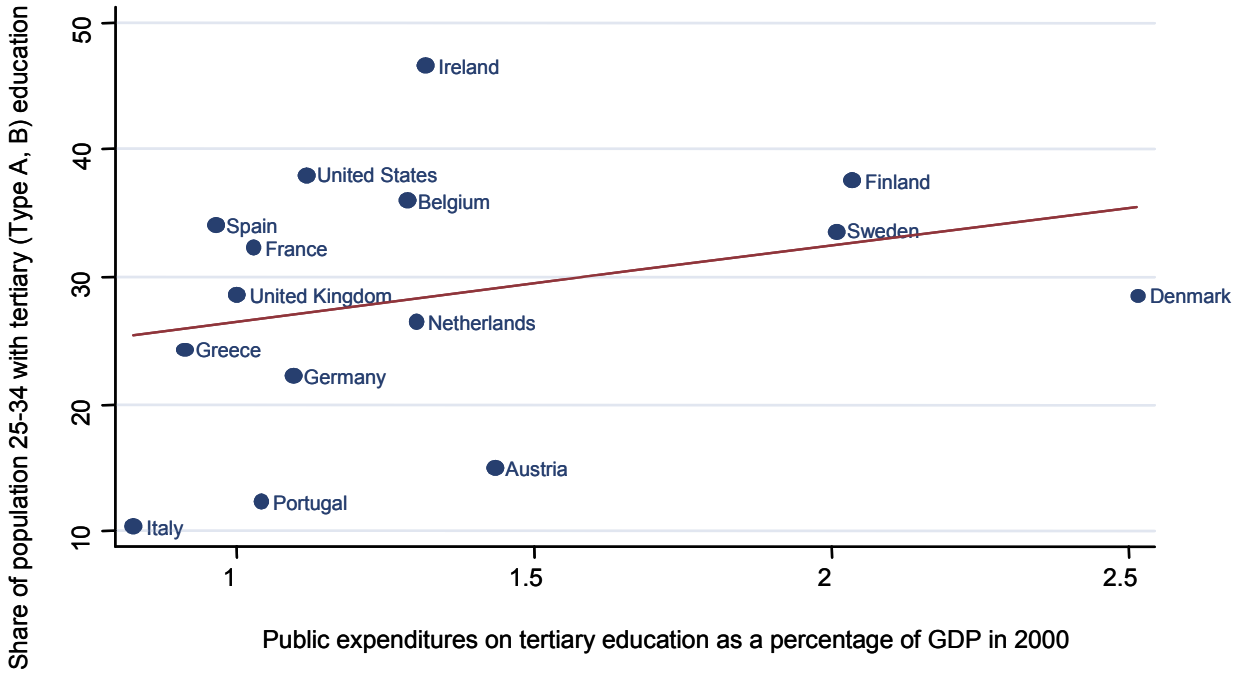
Source: OECD at a glance 2003.

Table 1.15: Participation in any type of education or training course during the four weeks prior to the survey

	1995-1999	2000-2002	2003
Austria	8.1	8.0	7.5
EU 15 (mean)	9.0	9.8	11.5
EU-15	6.6	8.5	9.7
Top EU 3	20.3	19.1	23.6
United States	n.a	n.a	n.a

Source: EU structural indicators.

Figure 1.1: Relationship between education input and output



Source: Education at a glance, own calculations.

1.3.6. Regulatory reforms and regulation of firm entry

Recent empirical evidence at the industry level and at the firm level indeed confirms that regulatory reforms increase MFP growth (OECD 2003a; see chapter 3 for a more detailed

analysis. In Europe there are large differences in the pace of regulatory reforms. Regulatory reforms in network industries started later in Austria than in many EU countries, but Austria reforms gathered speed in the 1990s and are now moving ahead (Table 1.16).

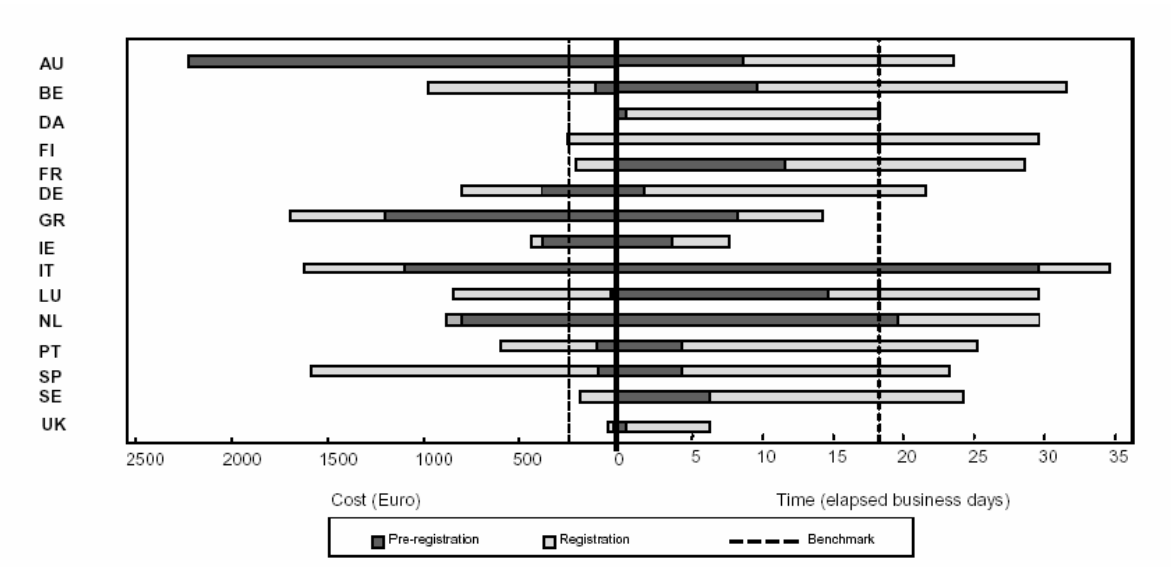
Table 1.16: Indicator on regulatory reforms in the network industries

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002	change 1980-1998	change 1990-1998
Austria	5.1	4.7	4.1	3.5	n.a.	-2.7	-2.1
EU13	5.3	5.0	4.4	3.5	n.a.	-3.0	-1.7
EU3	5.2	4.9	4.1	2.8	n.a.	-3.8	-1.9
United States	3.2	2.5	2.1	1.4	n.a.	-5.0	-5.4

Notes: The regulatory reform indicator measures on a scale from 0 to 6 (from least to most restrictive) restrictions on competition and private governance.

The European Commission (2002) publishes data on the costs of starting up a company. It investigates the quality of public service, using as indicators time, costs and number of procedures. According to the European Commission's report on Benchmarking the Administration of Start-ups (2002), the average time taken to set up an individual enterprise in Europe is 12 working days and 24 for private limited liability company. The costs necessary for a start up is higher in Austria is higher than in any other European country. Typical mandatory costs varied significantly as well - from 2,200 in Austria to zero in Denmark, with an average of 830. For a private limited company, the average duration of mandatory start-up procedures is 24 days, but in Ireland registration takes just seven days, and in the UK and Greece under 15. In Austria it takes 23 days. The benchmark was set at 18 days, which is the level of Denmark (see chapter 3 for more details).

Figure 1.2: The typical time and cost of setting up a private limited company



Source: Findings from Best Procedure project benchmarking the administration of start-ups.

1.3.7. Volatility of growth

Volatility of growth rates is much lower in Austria than that of EU countries between the period 1908-2002[9]. The coefficient of variation is on average over 2 times lower than among the EU 15 countries. During the period 1990-1994 much greater volatility of growth as expressed in the coefficient of variation can be observed for EU top 3 than that of EU-15.

Table 1.17: Volatility of growth of GDP per capita (coefficient of variation)

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002	mean 1980-2000
Austria	4.0	0.4	0.9	0.4	1.1	1.4
EU 15	9.6	0.6	2.4	0.3	0.9	2.8
EU Top 3	1.3	0.6	3.5	0.3	0.8	1.3
United States	4.0	0.2	1.6	0.2	2.3	1.6

Source: OECD MSTI 2003.

1.3.8. Public consumption, taxes and social security expenditures

The size of the government is another important element for sustainable growth. A general evaluation of this topic is however outside of the scope of this study. We just report the share of taxes, social security contributions, government consumption and subsidies in table 18 and the extent of the tax wedge in table 19. Total government receipts (taxes plus social security receipts) are 46 % of GDP in Austria (2000/2002), this is about 3 ½ % higher than on EU average and about the same percentage points below that in the top 3 countries. Both relations are rather stable over time. The tax wedge (difference between costs of employment to the firm and net income to the employee) is higher than in the EU for singles (lower for married employees), it is increasing in Austria while decreasing in the EU. The tax wedge is higher in the top countries but with decreasing (or less increasing) trend. The same holds for the government consumption. The three Nordic countries tend to have high tax ratios as well as high shares of government consumption.

[9] See the next chapter for more a more detailed analysis.

Table 1.18: Public consumption, taxes and social security expenditures

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002	change 1980/1984-2000/2002	change 1990/1994-2000/2002
	Total taxes revenues, % GDP						
Austria	27.8	28.1	27.7	27.8	28.8	0.2	0.5
EU 15 (mean)	26.0	27.3	27.5	28.6	29.2	0.7	0.7
EU Top 3 (mean)	35.2	38.7	37.8	39.3	39.3	0.6	0.5
United States	20.9	20.6	20.7	22.2	22.1	0.3	0.7
	Social security received by government, % GDP						
Austria	14.9	15.8	16.4	17.3	17.0	0.7	0.4
EU 15 (mean)	12.3	12.7	13.2	13.2	13.0	0.4	-0.1
EU Top 3 (mean)[1]	12.4	12.3	14.1	13.9	13.8	0.6	-0.3
United States	5.7	6.3	6.9	7.2	7.1	1.2	0.4
	Social security received by government and total taxes, % GDP						
Austria	42.7	43.9	44.0	45.1	45.8	0.4	0.4
EU 15 (mean)	38.3	40.0	40.7	41.8	42.2	0.5	0.4
EU Top 3 (mean)[1]	43.6	46.7	47.8	48.9	49.3	0.7	0.3
United States	6.3	6.9	7.2	7.1	7.2	0.7	0.0
	Government consumption, % GDP						
Austria	19.1	19.7	19.7	20.0	19.2	0.0	-0.3
EU 15 (mean)	21.6	20.9	21.5	20.9	20.9	-0.1	-0.3
EU Top 3 (mean)	26.0	24.8	26.2	25.2	24.7	-0.2	-0.7
United States	17.1	16.9	16.4	14.8	15.1	-0.7	-0.9
	Total subsidies, % GDP						
Austria	3.1	3.4	3.2	2.7	2.6	-1.1	-2.4
EU 15 (mean)	2.5	2.3	2.0	1.5	1.3	-3.7	-4.6
EU Top 3 (mean)	2.9	2.8	3.2	2.4	1.7	-2.5	-6.7
United States	0.6	0.5	0.4	0.3	0.4	-2.2	-0.4

Notes: [1] data for Denmark proved to be unreliable and are therefore excluded.
Source: OECD economic outlook.

Table 1.19: Tax wedge

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2002
	Total tax wedge incl. employer's social security contributions (Av. rate in %)				
	Married				
Austria	24.1	24.4	24.5	30.3	29.4
EU 15		33.1	32.1	32.9	30.2
EU 3	37.2	38.1	35.7	38.7	37.1
United States	27.3	25.6	24.7	23.4	19.1
	Single				
Austria	38.4	39.3	39.6	44.0	44.7
EU 15		43.3	42.7	43.2	41.4
EU 3	46.0	48.2	46.8	48.1	46.2
United States	35.1	31.8	31.2	31.1	30.1
	Income tax (Average rate in %)				
	Married				
Austria	7.1	5.7	2.8	5.4	8.6
EU 15	12.8	13.4	11.7	11.5	9.9
EU 3	29.9	31.6	29.0	28.0	25.6
United States	14.8	13.0	11.3	9.9	5.2
	Single				
Austria	9.8	8.9	7.9	9.9	10.2
EU 15	18.1	19.1	17.5	17.3	16.1
EU 3	34.3	36.6	33.1	30.5	27.7
United States	23.3	19.5	18.3	18.2	17.1

Notes: Employees' and employers' social security contributions and personal income tax less transfer payments as percentage of gross labour costs. As from 1991 on, data on wages have been revised to include only production workers (excluding employees).

1.3.9. Summary

These analyses reveal that physical investment in Austria is larger than the EU average. More precisely, Austrian level of physical investment is about 2 percentage points higher than the EU average and about 3.5 percentage points vs. the top European countries and the US. The comparatively high share, which is characteristic for medium-income countries, has widened to quite some extent over the last 20 years. Disaggregating into private and public investment, we find that the first is stable whereas the other has been declining since the early 90s. The decline in the public investment ratio is more pronounced in Austria than in other European Countries.

Gross expenditures on research and development have increased from 1.8 to 2.3 percent during the period 1998-2004. This indicates that Austria has caught up with the EU average, but is still far away from the position of the top EU countries and from the Lisbon target of about 3% in 2010. As we can see when looking at the composition of R&D, both total business R&D and public sector R&D (sum of the higher education sector and the government sector) is equal to the EU average (1.3% and 0.9%, respectively, in 2000-2002). Turning to government support for R&D, we observe that indirect government support (i.e. tax incentives) are higher than the EU average, while direct R&D subsidies as a percentage of GDP (i.e. government-financed business R&D) are slightly below the EU average. The quality of scientific research

institutions and industry-university cooperation rated by managers is similar to the EU average, but below the EU top countries.

The share of the Austrian labour force with tertiary education is one of the lowest in Europe, whereas the costs per students are among the highest in Europe. The share increases if we add post-secondary non-tertiary programmes, but it does not match that of the other countries for this extended definition of higher education. The low share of science and technology students and the low share of long life learning add to the list of problem areas in the Austrian education system for the changing needs of our globalising knowledge-based society as defined in the Lisbon targets. The share of ICT investment in total investment is 4 percentage points lower than the EU average, 6.6 percent lower than in the top EU countries and 16 percentage points lower than in the US. The share of ICT patents is less than half in relation to total patents as compared to the top countries and the US. It is one third lower than the EU average. All these figures together indicate that the structure of investment with a high share of physical investment and a low share of investment in intangibles does not match the structure of leading and fast-growing countries.

The pace of regulatory reforms is measured primarily for network countries. Austria's position is similar to the EU average, but again the top countries started earlier and have gone much further than Austria. The US also deregulated faster, even though the country had started from a lower level. The costs of entry are very high in Austria and entry is low, especially entry in the market for risky and innovative products.

The tax wedge for singles is higher in Austria than in the EU and the gap has widened over the past two decades, from 2.5% in the first half of the 80s to 4 percentage points in the late 90s as well as 2000-2002. Austria's tax rates and government consumption are rather stable and similar to the EU average, lower than in the top 3 countries. The volatility of demand is lower in Austria, with hard currency policy, social partnerships and the absence of severe crises having contributed to this.

1.4. Decomposition of differences in economic growth across countries

In this section we calculate the contribution of the input factors to economic growth in Austria. The elasticities used to perform the decomposition are from a growth equation that includes initial GDP, average years of schooling, business R&D intensity, the regulatory reform index and ICT patents. Given the estimated coefficients, the contribution of the kth explanatory variables (for country j in period t) is calculated by multiplying the estimated coefficient on variable K by the change in observed explanatory variable:[10]

$$C_{kit} = b_k(\Delta X_{kit} / X_{kit})$$

C_{kit} denotes the contribution of variable k to the predicted growth rate.

The contribution of the coefficient of variation of economic growth is calculated as:

$$C_{kit} = b_k(\Delta V_{it} / V_{it} - \overline{\Delta V_i / V_i})$$

[10] The contribution of economic growth of R&D, for example, is calculated by the actual change times its estimated impact based on the growth regressions.

where $\overline{\Delta V_i / V_i}$ denotes the time means.

Table 1.20 shows the decomposition of the growth of real GDP per capita. The contribution of each input to growth was computed for different sub periods, i.e. 1990/1995 vs. 2000/2002 and 1995/1999 vs. 2000/2002 to highlight the separate phases of economic growth. In the table, the first row shows the growth rate of GDP per capita between the time period 1990/1994 and 2000/2002 (averages) and rows three through eight show this growth rate among the contributions from the six inputs: Initial GDP, Investment ratio, average years of schooling, Business R&D, % GDP, Regulatory reform index and ICT patents.

The contributions are measured as a percentage of the predicted growth rate and as percentage points. The second column shows the predicted growth rate. For the EU average, the predicted growth rates are relatively close to the observed ones. For instance, the average growth rate of GDP per capita in EU 13 between 2000/2002 and 1990/1994 is about 2.2% which is close to the prediction of 2.0%. In Austria for the two time periods GDP per capita grew on average 1.8 and 2.1% per year, respectively. Cross-country variation in predicted growth is driven mainly by differences in initial GDP per capita. This variable alone predicts 1.3 percentage points per annum between the first half of the 90s and the first half of 2000s. Human capital accounted for about 12 and 15 percent of growth, while the contribution from business R&D was 15 and 11 percent, respectively. Between 1990/1994 and 2000/2002, the contribution to growth of GDP per capita of ICT patents was modest, accounting for 6 percent of the GDP per capita growth rate. Similar evidence can be found for regulatory reforms. Taken together this implies that 40 % (=0.8 percentage points) of the economic growth during the 1990s in Austria was attributable to the accumulation of human capital, business R&D, Regulatory reforms and ICT penetration. The corresponding figure for the EU top 3 countries is 54% (=1.1 percentage points). Thus we conclude that the different speed of technological change and deregulation generate and growth differential of 0.3 percentage point per year vis-à-vis EU top 3 countries.

In Europe as well as in Austria, total investment plays a minor role in explaining differences in predicted growth, since the investment share did not increase. The impact of investment, however, is more important in explaining economic growth in the US.

Table 1.20: Explaining past growth of GDP per capita

	actual	predicted	lagged GDP per capita[1]	Invest-ment, % GDP	years of schooling	BERD, % GDP	Regulatory reform index	ICT patents, % patents
		period 1990-1994 vs 2000-2002						
			sources in percentage points of predicted change					
Austria	1.8	2.1	1.3	-0.1	0.3	0.3	0.1	0.1
EU 13 (mean)	2.2	2.0	1.2	0.0	0.3	0.2	0.2	0.1
EU3 (mean)	2.4	2.0	1.0	-0.1	0.2	0.4	0.3	0.2
United States	2.1	2.5	1.4	0.6	0.1	0.1	0.3	0.1
			sources in percent of predicted change					
Austria		100	64	-5	12	16	6	6
EU13 (mean)		100	61	-1	14	9	10	6
EU3 (mean)		100	51	-3	9	18	14	11
United States		100	55	23	4	3	12	3
	actual	predicted	lagged GDP per capita[2]	Invest-ment, % GDP	years of schooling	BERD, % GDP	Regulatory reform index	ICT patents, % patents
		period 1995-1999 vs 2000-2002						
			sources in percentage points of predicted change					
Austria	2.1	2.1	1.4	-0.2	0.3	0.2	0.1	0.1
EU13 (mean)	2.6	2.8	1.6	0.3	0.3	0.3	0.2	0.1
EU3 (mean)	2.8	3.2	1.8	0.5	0.2	0.3	0.3	0.1
United States	1.8	2.7	2.0	0.1	0.0	0.1	0.3	0.1
			sources in percent of predicted change					
Austria		100	69	-8	15	11	6	6
EU13 (mean)		100	58	10	11	9	7	4
EU3 (mean)		100	57	14	5	11	9	5
United States		100	75	4	2	5	11	3

Notes: EU 13: All EU 15 member states excluding Ireland and Luxembourg. [1]Growth rate is calculated between 1990/1994 (average) vs. 1980-1984 (average). [2]Growth rate is calculated between 1995/1999 (average) vs 1990-1994 (average).

Table 1.21 shows the results of the growth decomposition based on the alternative growth equation model including the public investment ratio and the share of government consumption between the two periods 1995/1999 and 2000/2002. The decrease in the share of public consumption has contributed positively to economic growth in Austria and to a lesser extent in the EU top 3 countries. Furthermore, we find a zero contribution of private investment. In contrast, in the EU, the increase in the business investment ratio has contributed positively with about 0.1 percentage points per year. More importantly, for Austria we find that the decreasing public investment ratio tended to reduce GDP per capita of 0.5 percentage points per year between the second half of 1990s and 2000/2002.

We proceed by investigating the contribution of the volatility of growth on economic growth. We find a positive contribution of volatility of growth on economic growth in Austria but a negative contribution in EU top 3. However, differences in the volatility of economic growth explain only a small proportion of predicted growth. In Austria 0.04 percentage points of 2.1% growth can be attributed to low volatility of growth. The corresponding figure for EU top 3 is -0.02 percentage points. In EU 15 almost none of the cross-country variation in economic

growth can be attributed to differences in the volatility of growth. The impact of low volatility on growth may be biased downwards in the estimation, since lower volatility might increase consumption and investment directly. Table 1.22 contains the results of the decomposition using longer time series data for the period 1980-2002. Here, we find that the contribution of the volatility of growth is almost negligible in Austria and in EU top 3. Furthermore, the results for the contribution of the input factors are robust with the inclusion of volatility of growth. Based on the shorter time period, human capital maintained to contribute about 12 %, while that of business R&D decreased to 11% accounting for about 0.2 percentage points of output growth. The contribution to growth of ICT innovations also remains unchanged. Overall, the empirical results indicate that countries with higher volatility of growth have a significantly lower growth rate but the effect on growth of GDP per capita is quite small. The results should be interpreted with caution and should not be the sole basis for determining the effects of the volatility of growth. Indeed, it may be the case that changes in the volatility of growth have an impact on investment rather than on economic growth. The relationship between the volatility of growth rates and growth will be examined in more detail in Chapter 2.

Table 1.21: Explaining past growth of GDP per capita: role of public investment and public consumption (alternative model 1)

	actual growth rate	predicted growth rate	lagged GDP per capita[1]	private Investment, % GDP	public Investment, % GDP	years of schooling	BERD, % GDP	government consumption, % GDP
		period 1995/1999 vs 2000/2002						
			sources in percentage points of predicted change					
Austria	2.1	1.8	1.7	0.0	-0.5	0.2	0.1	0.4
EU 13 (mean)	2.6	2.2	1.9	0.1	-0.1	0.2	0.1	0.0
EU3 (mean)	2.8	2.7	2.1	0.2	-0.1	0.1	0.2	0.2
United States	1.8	2.2	2.4	-0.1	0.0	0.0	0.1	-0.2
			sources in percent of predicted change					
Austria		100	92	0	-29	9	6	21
EU13 (mean)		100	88	4	-3	7	6	-1
EU3 (mean)		100	79	7	-3	3	6	8
United States		100	108	-4	2	1	3	-10

Notes: EU 13: All EU 15 member states excluding Ireland and Luxembourg. [1]The annual average growth rate is calculated between 1990/1994 (period averages) vs. 1980/1984 (averages).

Table 1.22: Explaining past growth of GDP per capita: role of volatility of growth (alternative model 2)

	actual growth rate	predicted growth rate	lagged GDP per capita[1]	Investment, % GDP	years of schooling	BERD, % GDP	Regulatory reform index	ICT patents, % patents	volatility of growth
		period 1990-1994 vs 2000-2002							
			sources in percentage points of predicted change						
Austria	1.8	2.2	1.5	-0.1	0.3	0.2	0.1	0.1	0.04
EU 13 (mean)	2.1	2.1	1.4	0.0	0.3	0.1	0.2	0.1	0.00
EU3 (mean)	2.4	2.0	1.1	-0.1	0.2	0.3	0.3	0.2	-0.02
United States	2.1	2.6	1.5	0.5	0.1	0.1	0.3	0.1	0.00
			sources in percent of predicted change						
Austria		100	68	-4	13	11	6	5	2
EU 13 (mean)		100	65	-1	15	6	10	5	0
EU3 (mean)		100	57	-3	10	13	14	10	-1
United States		100	58	21	4	2	12	2	0
		period 1980-1894 vs. 2000-2002							
			sources in percentage points of predicted change						
Austria	1.9	2.1	1.4	0.0	0.3	0.2	0.1	0.1	0.00
EU 13 (mean)	2.0	2.0	1.5	-0.1	0.3	0.1	0.1	0.1	-0.13
EU3 (mean)	1.9	2.1	1.5	-0.2	0.2	0.2	0.2	0.1	0.00
United States	2.0	1.9	1.5	-0.1	0.1	0.0	0.2	0.1	-0.02
			sources in percent of predicted change						
Austria		100	69	-2	14	8	5	6	0
EU 13 (mean)		100	75	-4	15	7	7	6	-6
EU3 (mean)		100	71	-9	10	12	9	7	0
United States		100	81	-3	7	2	12	3	-1

Notes: EU 13: All EU 15 member states excluding Ireland and Luxembourg. [1]Growth rate is calculated between 1990/1994 (average) vs 1980-1984 (average).

Appendix to Chapter 1

Table 1.23: Panel estimates: Impact of different R&D categories, patents and regulatory reforms

		exogenous var.	GDP per capita	Investment, % GDP	years of schooling	R&D, % GDP	population 15-64, growth	constant	# of obs	# of countries
EPO patent applications per population	coeff	-0.01	0.88**	0.22**	0.12	0.04	-0.01	0.02	94	21
	t-value	-0.85	7.01	3.99	0.87	1.48	-0.05	1.05		
EPO ICT patent applications, % Total EPO patents	coeff	0.04**	0.78**	0.28**	0.02	0.05	-0.09	0.02*	93	21
	t-value	2.40	7.11	7.01	0.14	1.46	-0.78	1.97		
EPO Biotechnology patents, % patents	coeff	0.01	0.86**	0.24**	0.11	0.03	0.00	0.02	90	21
	t-value	0.63	6.92	4.62	0.97	1.21	0.00	0.96		
Government Expenditures on R&D, % GDP	coeff	-0.08**	0.91**	0.23**	0.26*	0.06**	0.14	0.00	78	21
	t-value	-3.29	10.44	4.61	1.85	2.36	0.94	-0.15		
HERD, % GDP	coeff	0.02	0.83**	0.23**	0.11	0.02	0.17	0.02	78	21
	t-value	0.84	9.87	4.37	0.62	0.82	1.07	1.31		
Regulation index	coeff	-0.04**	0.79**	0.24**	0.37**	0.05**	-0.01	-0.01	78	21
	t-value	-5.15	4.31	4.28	2.05	2.61	-0.04	-0.27		

Table 1.24: Panel estimates: Impact of government size evaluated individually

		exogenous var.	GDP per capita	Investment, % GDP	years of schooling	R&D, % GDP	population 15-64, growth	constant	# of obs	# of countries
Gross Government Debt, % GDP	coeff	-0.05	0.52	0.24	0.12	0.04	-0.29	0.06	91	20
	t-value	-2.47	6.91	4.56	0.98	1.68	-2.49	5.32		
direct tax/Indirect taxes	coeff	0.07	0.55	0.26	-0.09	0.04	-0.30	0.06	95	19
	t-value	1.98	3.16	8.39	-0.80	1.42	-1.87	2.71		
Indirect taxes, % GDP	coeff	-0.17	0.52	0.25	0.13	0.03	-0.22	0.06	103	20
	t-value	-1.93	4.60	8.15	0.78	1.50	-1.82	3.58		
Direct taxes, % GDP	coeff	0.02	0.59	0.26	-0.05	0.04	-0.26	0.05	97	19
	t-value	0.40	3.15	8.28	-0.38	1.53	-1.78	2.15		
Employment, government, % total employment	coeff	-0.17	0.73	0.19	0.21	0.04	-0.17	0.03	104	20
	t-value	-2.82	4.16	4.70	1.16	2.55	-1.57	1.28		
Government consumption, % GDP	coeff	-0.32	0.81	0.19	0.17	0.04	-0.22	0.02	102	19
	t-value	-3.83	5.96	6.67	1.51	3.11	-2.18	1.64		
Government Consumption, excluding wages, % GDP	coeff	-0.14	0.66	0.24	0.06	0.03	-0.21	0.05	105	20
	t-value	-1.88	4.07	9.55	0.43	1.27	-1.65	2.59		
government consumption, wages, % GDP	coeff	-0.22	0.77	0.21	0.18	0.04	-0.21	0.02	105	20
	t-value	-3.14	4.80	5.24	1.18	3.71	-2.12	1.00		
Social security contributions, % GDP	coeff	-0.18	0.65	0.21	0.00	0.07	-0.04	0.04	95	19
	t-value	-3.18	5.18	3.98	-0.04	3.90	-0.27	2.42		
	coeff	-0.06	0.65	0.26	-0.07	0.02	-0.08	0.04	105	20
subsidies, % GDP	t-value	-3.23	5.00	7.19	-0.47	0.94	-0.67	2.18		
Taxes and social security contributions, % GDP	coeff	-0.34	0.66	0.21	0.31	0.07	-0.07	0.03	95	19
	t-value	-3.13	5.05	4.10	1.92	3.76	-0.55	1.70		
	coeff	-0.06	0.60	0.25	0.05	0.05	-0.20	0.04	95	19
Total taxes, % GDP	t-value	-0.68	3.63	7.08	0.31	1.95	-1.18	1.97		
Primary government deficit, % GDP	coeff	-0.81	0.66	0.21	-0.11	0.04	-0.22	0.04	100	20
	t-value	-3.62	3.91	6.60	-1.17	2.22	-1.68	1.88		

Notes: The Table gives the Arellano and Bond (1991) first-difference one step GMM estimates. t-values are robust to heteroscedasticity.

Table 1.25: Panel estimates: Impact of other variables on economic growth

		exogenous var.	GDP per capita	Investment, % GDP	years of schooling	R&D, % GDP	population 15-64, growth	constant	# of obs	# of countries
corruption perception index	coeff	-0.03	0.84**	0.22**	0.20	0.03	0.20	0.01	79	21
	t-val.	-1.13	8.25	4.05	1.51	1.04	1.33	0.91		
Inflation rate, %	coeff	-0.03	0.70**	0.26**	0.06	0.04**	-0.12	0.04**	109	21
	t-val.	-1.68*	4.93	7.97	0.50	2.77	-0.93	2.61		
structural unemployment rate, in %	coeff	-0.05**	0.59**	0.20**	-0.01	0.06**	-0.19*	0.05**	107	21
	t-val.	-2.71	4.33	4.57	-0.13	2.87	-1.90	3.49		
Labour Force, Participation Ratio in %	coeff	0.09	0.66**	0.28**	-0.13	0.04**	-0.24**	0.05**	109	21
	t-val.	0.59	4.67	7.00	-1.17	2.05	-2.38	3.58		
self-employed, % population 15-64	coeff	-0.004	0.62**	0.29**	-0.07	0.03*	-0.25**	0.05**	109	21
	t-val.	-0.14	4.32	9.77	-0.61	1.89	-2.31	3.34		
Workers involved in to strikes per employee	coeff	-0.004	0.63**	0.28**	-0.08	0.03*	-0.22**	0.05**	108	21
	t-val.	-1.07	4.27	8.97	-0.73	1.89	-2.05	2.98		
Working days lost due to strikes per employee	coeff	-0.002	0.61**	0.26**	-0.11	0.04**	-0.23**	0.05**	106	21
	t-val.	-0.50	4.54	8.96	-0.88	2.84	-2.09	3.39		
net union density rate (less retired) in %	coeff	-0.001	0.49**	0.26**	-0.18	0.05*	-0.41**	0.07**	61	16
	t-val.	-1.28	5.54	7.32	-0.60	1.82	-3.93	4.78		
coverage rate adjusted in %	coeff	-0.14**	-0.19	0.30**	0.18	0.03	-0.21	0.10**	34	16
	t-val.	-2.81	-1.09	4.81	0.51	0.74	-1.31	4.20		
openness	coeff	0.16*	0.58**	0.25**	-0.07	0.04**	-0.25**	0.05**	109	21
	t-val.	1.94	5.12	6.20	-0.47	2.37	-2.45	3.28		
terms of trade	coeff	0.13**	0.70**	0.28**	-0.13	0.03*	-0.17	0.04**	109	21
	t-val.	2.55	5.01	8.65	-1.23	1.91	-1.38	2.58		

Notes: The Table gives the Arellano and Bond (1991) first-difference one step GMM estimates. t-values are robust to heteroscedasticity. All variables are transformed into logarithms except net union density rate (less retired) in % and openness.

Table 1.26: Panel estimates of the impact of human capital, R&D and patents on GDP per capita growth, five-year intervals, 1985-1999

	(1)		(2)		(3)		(4)	
	coeff.	t value	coeff.	t value	coeff.	t value	coeff.	t value
lagged GDP per capita in ppp	0.77**	3.23	0.70**	4.89	0.84**	4.97	0.72**	4.31
Investment, % GDP	0.25**	4.20	0.28**	5.22	0.29**	5.55	0.28**	4.94
average years of schooling	0.35	1.68	0.30	1.71	0.45**	3.16	0.40*	2.28
R&D (BERD) % GDP	0.05*	2.21	0.06	1.89	0.08**	2.82	0.04	1.37
R&D (HERD), % GDP							0.01	0.44
Government Expenditures on R&D, % GDP					-0.10**	-3.42		
EPO patent applications per population	0.00	0.34						
EPO ICT patent applications, % total EPO patent applications			0.03**	2.66				
Regulatory reform indicator	-0.04**	-5.66	-0.04**	-4.70	-0.03**	-3.04	-0.04**	-3.55
population 15-64, growth	-0.03	-0.13	-0.08	-0.47	0.09	0.51	0.18	0.94
constant	-0.01	-0.24	0.00	-0.03	-0.02	-1.24	-0.01	-0.33
# of obs. (# of countries)	76 (21)		77 (21)		62 (21)		62 (21)	

- * and **, statistically significant at the 5 and 1 per cent level respectively. The Table gives the Arellano and Bond (1991) first-difference one step GMM estimates. t-values are robust to heteroscedasticity. Model 1 and 2 uses observations for the five-year intervals, 1980-1984, 1985-1989, 1990-1994 and 1995-1999. Model 3 and 4 uses observations for the intervals 1985-1989, 1990-1994, 1995-1999 and 2000-2002.

Table 1.27: Panel estimates of the impact of human capital, R&D and patents on GDP per capita growth, five-year intervals, 1985-1999

	(1)		(2)	
	coeff.	t value	coeff.	t value
lagged GDP per capita in ppp	0.794**	5.32	0.725**	5.37
Investment, % GDP	0.274**	6.19	0.283**	5.27
average years of schooling	0.295*	1.75	0.265	1.61
R&D (BERD) % GDP	0.046	1.61	0.059*	1.85
Regulatory reform indicator	-0.034**	-3.43	-0.035**	-3.92
EPO ICT patent applications, % total EPO patents	0.029**	2.60	0.031**	2.58
population 15-64, growth	0.057	0.36	-0.018	-0.11
volatility of growth rates	-0.001**	-5.47	-0.001**	-7.24
period dummy 1985-1989	0.030*	1.69		
period dummy 1990-1994	0.012	0.62		
period dummy 1995-1999	0.014	0.85		
constant	-0.024	-0.81	0.00	-0.03
# of obs. (# of countries)	75 (21)		75 (21)	

- * and **, statistically significant at the 5 and 1 per cent level respectively. The Table gives the Arellano and Bond (1991) first-difference one step GMM estimates. t-values are robust to heteroscedasticity.

Table 1.28: Panel estimates of the impact of government size by expenditure categories, five-year intervals, 1975-2002

	(1)		(2		(3)	
	coeff.	t-value	coeff.	t-value	coeff.	t-value
lagged GDP per capita in ppp	0.82**	6.67	0.80**	6.47	0.80**	7.44
private fixed investment	0.13**	4.06	0.11**	3.39	0.17**	6.43
fixed investment government, % GDP	0.05*	2.16	0.05*	2.30	0.04	1.84
average years of schooling	0.16	1.21	0.20	1.51	0.15	1.16
R&D (BERD) % GDP	0.03*	2.54	0.04**	3.02	0.04**	3.75
total government consumption, % GDP	-0.41**	-5.74			-0.28**	-4.81
subsidies, % GDP					-0.05*	-2.55
government consumption,excluding wages, % GDP			-0.19**	-4.02		
government consumption, wages, % GDP			-0.21**	-5.49		
population 15-64, growth	-0.16	-1.59	-0.11	-0.99	-0.04	-0.35
constant	0.02	1.64	0.02	1.47	0.02	1.20
# of obs (# of countries)	98 (18)		98 (18)		98 (18)	

- * and **, statistically significant at the 5 and 1 per cent level respectively. All variables are transformed into natural logarithm, except population growth. The models use observations for the intervals 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999 and 2000-2002.

Table 1.29: Panel estimates of the impact of government size by revenue categories, five-year intervals, 1975-2002

	(1)		(2)		(3)	
	coeff	t-value	coeff	t-value	coeff	t-value
lagged GDP per capita in ppp	0.69**	5.93	0.66**	5.89	0.65**	6.14
Investment, % GDP	0.17**	4.58	0.17**	4.59	0.17**	4.89
average years of schooling	0.16	1.32	0.15	1.23	0.19	1.57
R&D (BERD) % GDP	0.06**	3.77	0.06**	3.51	0.06**	3.46
Total taxes, % GDP	-0.13*	-2.15	-0.14**	-2.44		
Ratio of direct to indirect taxes			0.03	1.10		
Indirect taxes, % GDP					-0.12*	-2.45
Direct taxes, % GDP					-0.04	-1.24
Social security contributions, % GDP	-0.13**	-2.95	-0.13**	-2.91	-0.12**	-2.91
primary budget deficit, % GDP	-0.69**	-4.18	-0.66**	-4.03	-0.65**	-4.07
population 15-64, growth	-0.05	-0.37	-0.07	-0.50	-0.08	-0.62
constant	0.03	1.63	0.03	1.85	0.03	1.92
# of obs (# of countries)	94 (19)		94 (19)		94 (19)	

The models use observations for the intervals 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999 and 2000-2002.

Table 1.30: Panel estimates of the impact of government size by both revenue and expenditure categories, five-year intervals, 1975-2002

	(1)		(2)		(3)	
	coeff.	t-value	coeff.	t-value	coeff.	t-value
lagged GDP per capita in ppp	0.74**	5.71	0.75**	5.83	0.73**	6.21
Investment, % GDP	0.16**	7.05	0.16**	6.76	0.16**	5.52
average years of schooling	0.16	1.66	0.21*	2.18	0.08	0.75
R&D (BERD) % GDP	0.07**	5.37	0.08**	5.84	0.08**	7.33
primary budget deficit , % GDP	-0.40	-1.99	-0.49	-1.77	-0.41*	-2.02
Total taxes, % GDP			-0.06	-0.81		
Social security contributions, % GDP					-0.09**	-2.60
total government consumption, % GDP	-0.26*	-2.27	-0.24	-1.77	-0.17	-1.62
population 15-64, growth	-0.22*	-2.05	-0.23	-1.82	-0.15	-1.33
constant	0.02	1.44	0.02	1.23	0.02	1.82
# of obs (# of countries)	94 (19)		91 (18)		91 (18)	

2. Aggregate Demand and Economic Growth

Markus Marterbauer

2.1. The contribution of exports to economic growth

Exports of goods and services currently account for more than half of Austria's GDP (51.8 percent in the year 2003). Therefore, export performance is essential for economic growth. Growth in exports of goods and services has been dynamic and markedly above the European average during the last decades. Between 1970 and 2003, Austrian exports have been growing on average by 8.2 percent p.a. in nominal terms. The gradual integration of the Austrian economy into the European Union[11], starting in the early 1970s, has clearly been favouring trade links with European partners and, subsequently, export growth.

2.1.1. Foreign balance and growth

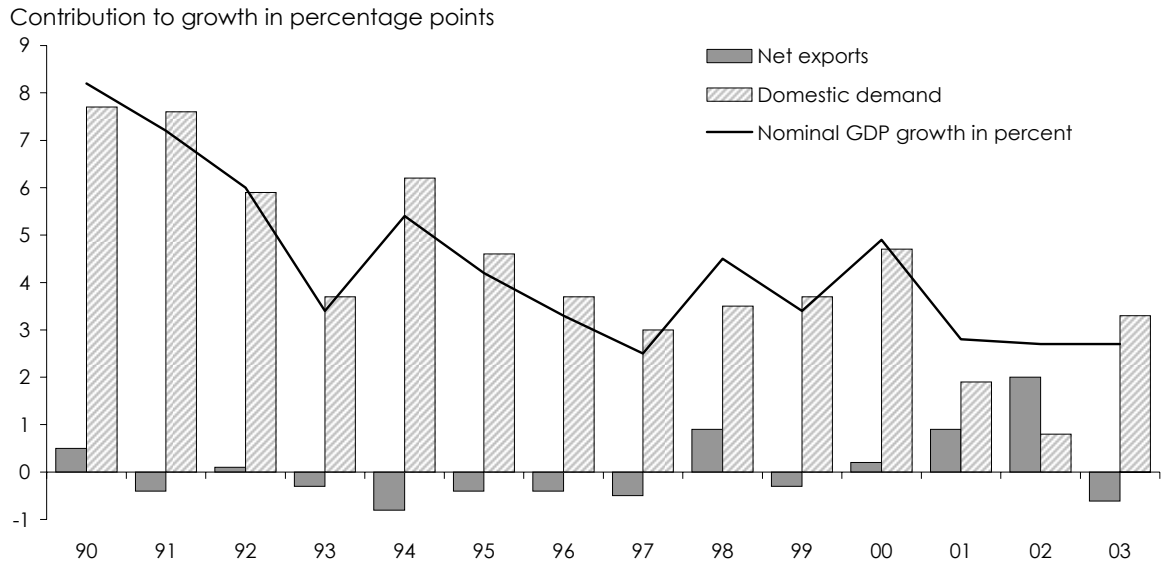
The traditional method of measuring the contribution of exports to GDP growth is by using the foreign balance. The net effect of exports minus imports on growth, however, has been relatively small in Austria. According to the SNA figures, the foreign balance did not, on average, contribute to GDP growth between 1976 and 2003 (+0.1 percentage point per year). Between 2000 and 2003, the contribution was on average +0.6 percentage point per year.

The rather small contribution of net exports in the long run is mainly due to the strong growth dynamics of imports. Imports of goods and services have been growing by 8.2 percent p.a. between 1970 and 2003 and by 6.2 percent p.a. between 1990 and 2003, respectively. However, the traditional approach of measuring the growth contribution of net exports ("Lundberg method") is not adequate. The Lundberg method assumes that the restrictive effects of aggregate import growth diminish the expansionary effects of export growth on GDP. However, imports are not only determined by exports, but also by domestic demand.

Input-Output analysis allows evaluating the specific import contents of demand components. The contribution of exports to GDP growth can therefore also be calculated based on a separation of the import content of foreign demand from the import content of domestic demand, with the result being considerably higher than that of the "Lundberg method". The import content of exports in Austria according to the Input-Output table is currently about 39 percent, while it is 27 percent for domestic demand. Analyses based on this more adequate method result in a net contribution of exports to GDP growth of more than one percentage point in the period 1990 to 2003. About one third of the growth of nominal Austrian GDP can be attributed to exports of goods and services.

[11] All data concerning the EU refer to the EU 15.

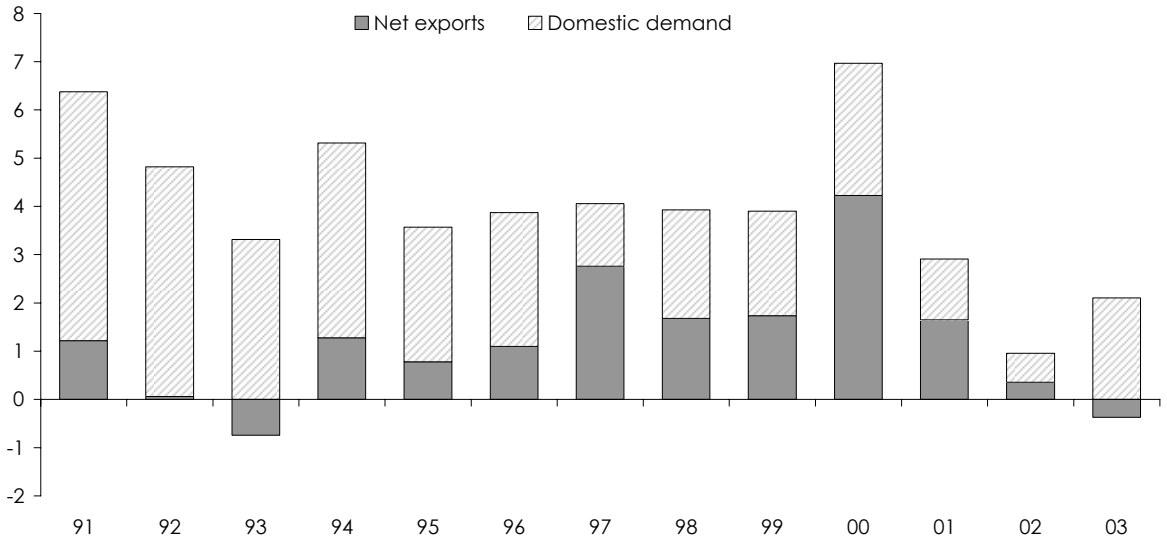
Figure 2.1: Net exports, domestic demand and GDP growth in Austria (SNA)



Source: Statistik Austria, WIFO.

Figure 2.2: Net contribution of exports and domestic demand to GDP growth in Austria (Input-Output table)

Percentage points



Source: Statistik Austria, WIFO.

2.1.2. Moderate growth in Germany and Italy restricting Austrian exports in the second half of the 1990s

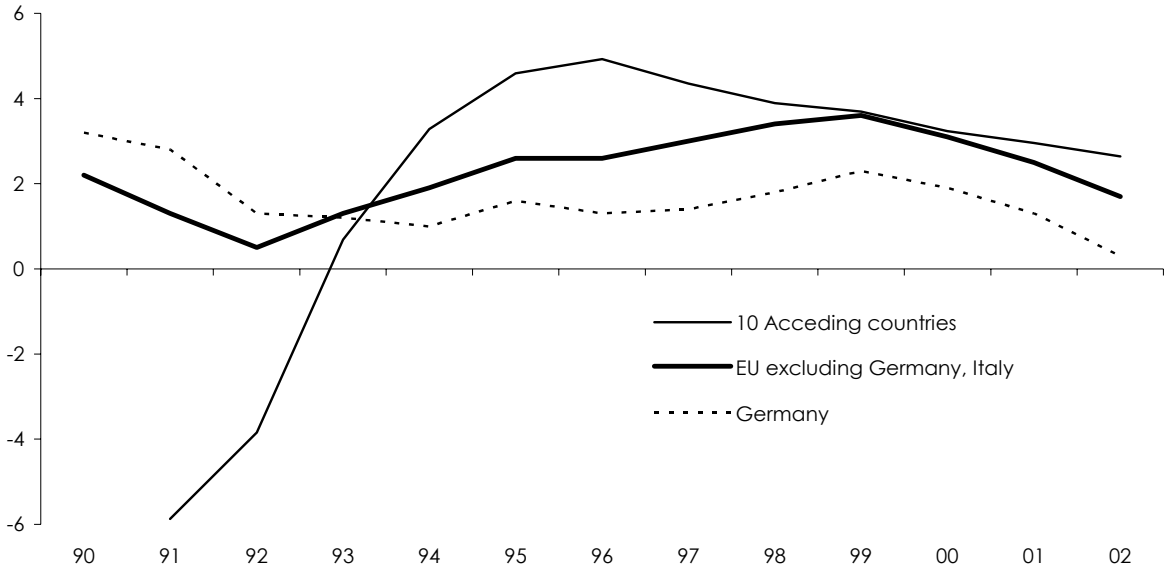
The development of aggregate demand in Austrian trading partners' economies is the most important determinant of Austria's export performance. On average, the elasticity of Austrian

export growth rates in relation to GDP growth in the industrialised economies is around 2.5. An increase of the GDP growth rate of the OECD economies by one percent creates a rise in Austrian exports by 2.5 percent.

Especially since the second half of the 1990s, Austrian exports have been dampened by the moderate expansion of aggregate demand in the economies of Austria's two most important trading partners, Germany and Italy. On the other hand, Austrian exports have been favoured by the catch-up process in the accession countries.

Figure 2.3: Real GDP growth in EU and acceding countries

Percentage change, 3-year moving average



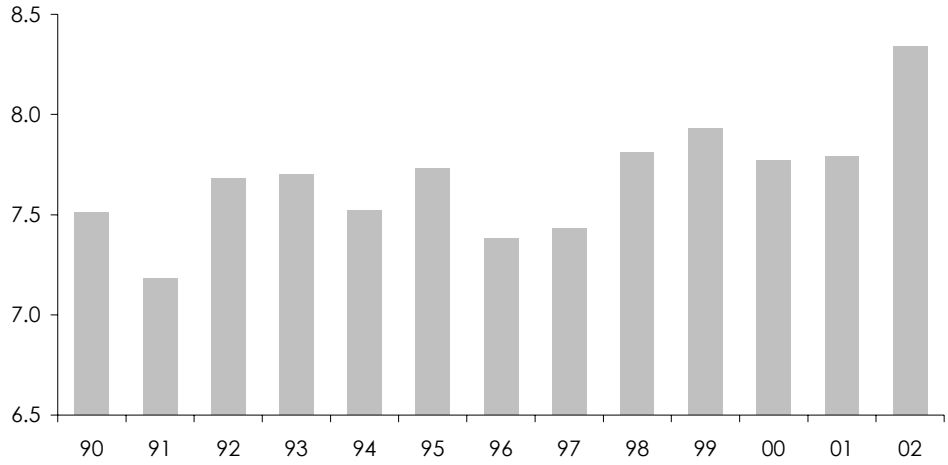
Source: OECD, WIFO.

With currently about one third of Austrian exports of goods going to Germany, it is by far Austria's most important trading partner. Hence, macroeconomic developments in Germany are of high importance to the Austrian economy. For decades, German GDP growth has been broadly in line with the macroeconomic performance of the EU average, but the German unification has had major effects on growth rates since the early 1990s.

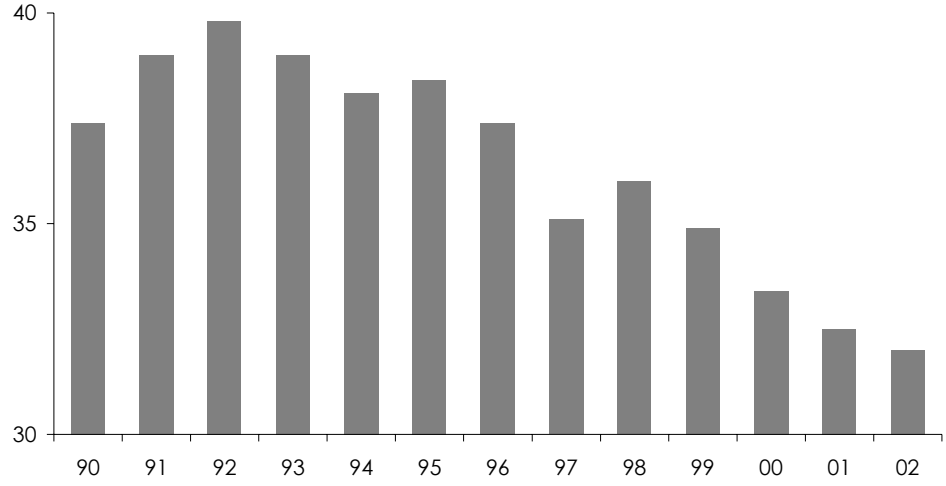
Austrian exports to Germany have, however, been growing markedly faster than the EU average in the 1970s and 1980s, increasing from 25 percent of total exports at the end of the 1960s to nearly 40 percent in the early 1990s. This is often related to the trade creation effects of the stable exchange rate between the Austrian schilling and the German mark. The fixed exchange rate contributed to a stabilisation of expectations of Austrian exporters, helped to establish links between Austrian supplying industries and German car industries and lead to an increasing concentration of Austrian exports towards the German market.

Figure 2.4: Austrian exporters on the German market

Market share
As a percentage of EU exports



Export share
As a percentage of total exports

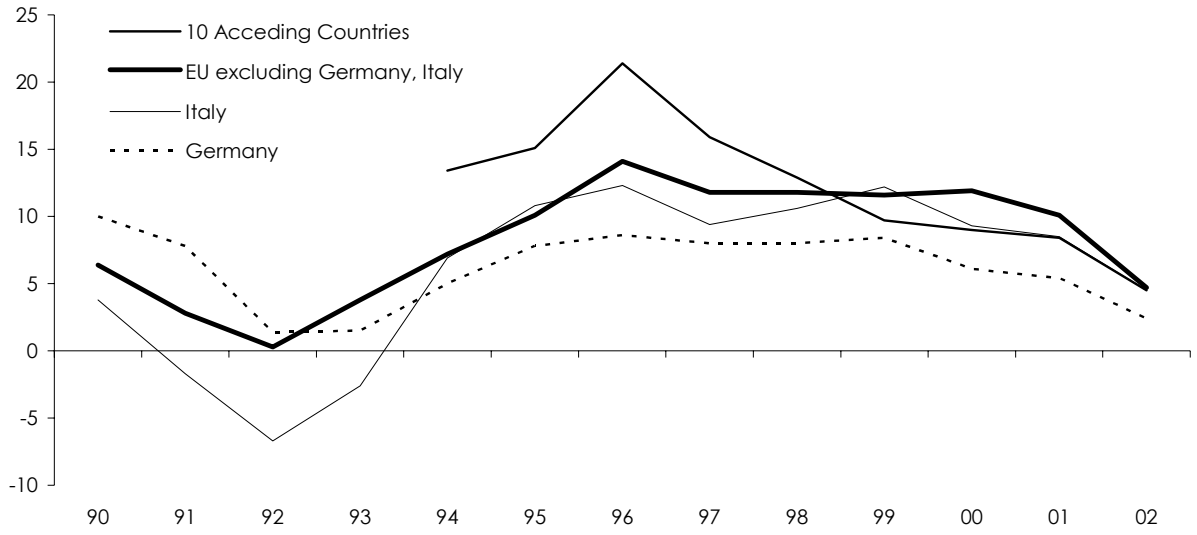


Source: OECD.

Since the early 1990s, however, German economic performance has been unusual. In the early years of the decade, the boom after the German unification boosted aggregate demand and GDP growth rates. Yet after 1993, macroeconomic costs of the unification have been higher than returns, and GDP growth rates in Germany have been considerably lower than the EU average.

Figure 2.5: Growth of Austrian exports

Percentage change, 3-year moving average



Source: Statistik Austria, WIFO.

This very specific macroeconomic situation in Germany is reflected in the growth rates of Austrian exports to Germany. From 1990 to 2003, Austrian exports of goods to Germany have been growing by about 5½ percent on average, which is not far below the growth rate of Austrian exports to the EU 15 without Germany (6 percent p.a.). While German demand for Austrian goods has been increasing by 1½ percent p.a. between 1990 and 1993, demand from the other EU economies has been declining by 4½ percent per year on average in this period. Hence, Austria has been one of the economies profiting the most from the German unification, while on the other hand exports to other EU economies have been dampened by the recession. In the years thereafter, the picture changed considerably and the growth of Austrian exports to Germany has been markedly lower than the growth of exports to other EU economies (6½ percent per year in relation to more than 9 percent).

The share of Austrian exports going to Germany increased during the unification boom period, reaching nearly 40 percent in 1992. However, it has been declining to 32 percent since then. This is mainly due to the rising shares of exports to Central and Eastern European economies. Austrian exporters have even been gaining market shares on the German market.

Table 2.1: Austria's export performance

	Austrian exports to Germany	EU excluding Germany
Ø 1970/2002	+9.8	+ 8.2
Ø 1990/2002	+5.7	+ 6.4
Ø 1990/1993	+1.5	– 4.4
Ø 1994/2002	+7.2	+10.3

Source: OECD, WIFO.

Italy is Austria's second most important trading partner with a share of 9 percent of total Austrian exports. Italy's growth performance was weak during the 1990s, which was primarily an effect of the very restrictive fiscal policy pursued in order to qualify as an early member of the EMU. Consequently, Austrian exports to Italy grew slower than average in the 1990s.

The weakness in aggregate demand in the two most important trading partners' economies was dampening Austrian export and GDP growth considerably from 1994 to 2002. In particular, exports to Germany have been relevant for Austria's macroeconomic performance. The positive margin of exports to Germany in relation to exports to the other EU economies was pushing Austrian GDP by about +¾ percentage point per year in the early 1990s. On the other hand, the negative margin has been dampening GDP growth by about $^1/_3$ percentage point per year since 1994. The dampening effect of weak exports to Italy has been less than $^1/_{10}$ percentage point per year since 1994 (as only one tenth of Austrian exports are going to Italy).

Table 2.2: Growth effects of Austria's exports to Germany

Annual contribution of exports to Germany to Austria's real GDP growth in percentage points

Ø 1990/1993	+ 0.8
Ø 1994/2002	– 0.3
Ø 1990/2002	+ 0.0

The amount of the negative effect seems to be rather small, considering the negative growth margin of the German economy in relation to other Euro-area economies during the 1990s. This is due to the specific demand structure of the weakness in German growth. In general, not exports, but investment in construction and equipment as well as consumption mainly contributed to the weak growth performance. The strong decline in construction during the second half of the 1990s was an after-effect of the reunification boom and a manifestation of the country-specific cycle in residential building.

Moderate growth rates of consumption are the outcome of weak development of employment and low wage increases in Germany. Exports of goods and services, however,

have been growing above European average, and Germany's production is gaining market shares on international markets.

Austrian exports to Germany are not linked to the German construction industry, but primarily to the German export industry, which has been developing quite well during the last decades. Only scarcely has Austria been affected by German economic problems.

Table 2.3: Components of real demand

Percentage change, p.a.

	Germany			Euro area		
	Ø 1990/2002	Ø 1994/2002	Ø 1997/2002	Ø 1990/2002	Ø 1994/2002	Ø 1997/2002
Gross Domestic Product	+ 1.7	+ 1.5	+ 1.6	+ 1.9	+ 2.2	+ 2.3
Private consumption	+ 1.8	+ 1.4	+ 1.6	+ 1.8	+ 2.0	+ 2.3
Public consumption	+ 1.5	+ 1.3	+ 1.3	+ 1.9	+ 1.8	+ 2.1
Gross fixed capital formation	+ 0.6	– 0.3	– 0.3	+ 1.4	+ 2.5	+ 2.7
Exports	+ 5.7	+ 7.1	+ 7.0	+ 6.2	+ 6.8	+ 6.7

Source: European Commission, OECD.

2.1.3. Rising share of exports to Central and Eastern European countries

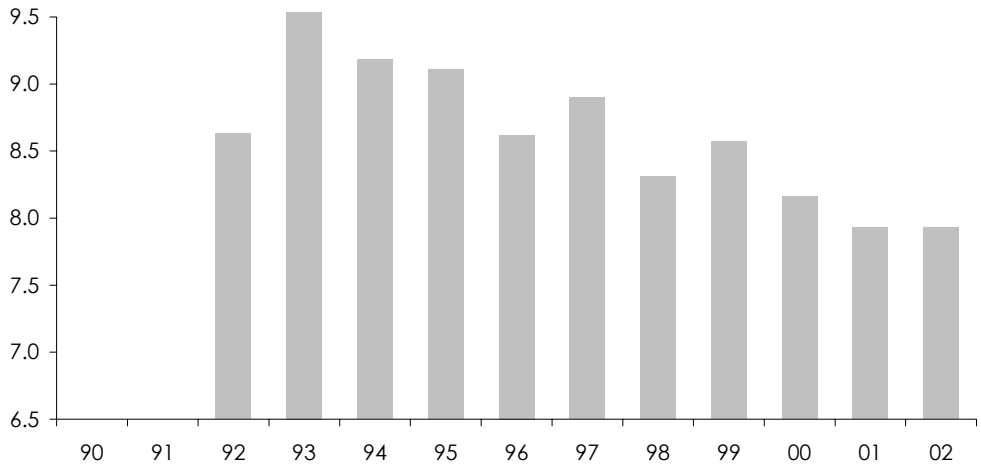
The restrictive effects of German and Italian economic stagnation in the latter part of the 1990s have been partly compensated by dynamic growth rates of demand from other regions. This is true for the marked growth rates of exports to North America: Austria's exporters profited considerably from the economic boom in the USA in the second half of the 1990s. The share of Austria's exports to the USA has doubled in the last ten years.

In addition, the expansionary effect of the catch-up process in the ten acceding countries has been favouring Austrian exports. On average, GDP growth rates in these economies have been as high as in the EU 15 countries between 1990 and 2003. In the early 1990s, GDP in the then transformation economies declined considerably. However, since 1994, the positive growth margin has been on average about 1¼ percentage points per year. The catch-up process of these economies has been slower than commonly assumed.

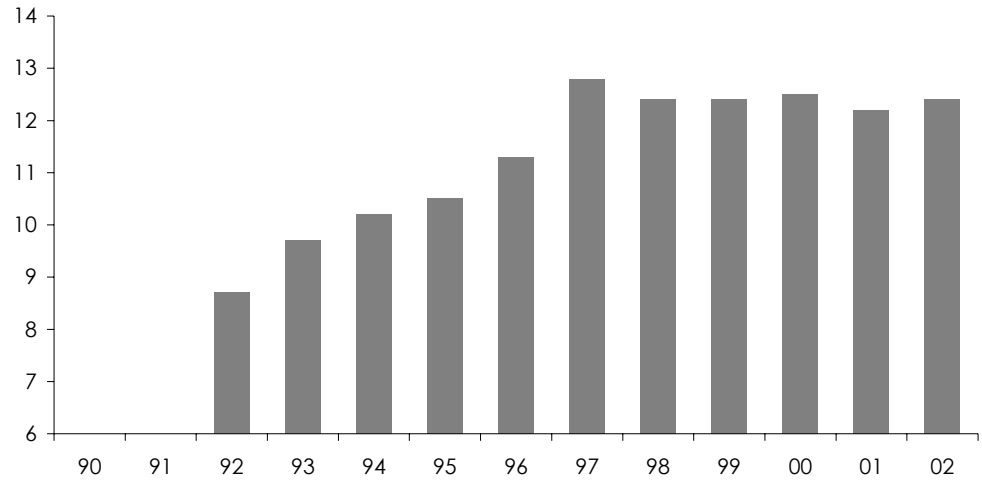
Austria is positively affected by the above-average rates of GDP growth due to the intensive trade relations with the ten new EU member countries. These countries currently receive 13 percent of Austrian goods exports, while in 1992, this ratio was only 9 percent. Growth rates of goods exports to these markets (11.7 percent per year in 1992 to 2003) have been considerably higher than export growth on average (7.5 percent).

Figure 2.6: Austrian exporters on the markets of the accession countries

Market share
As a percentage of EU exports



Export share
As a percentage of total exports



Acceding countries: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia.
Source: OECD.

During the 1990s, Austrian exporters were losing market shares in the acceding countries. The close historical links between Austria and some of the acceding countries allowed establishing a strong position on the new markets in the early years after opening up. In the second half of the 1990s, other Western European countries were gaining market shares in these areas. The market share of Austrian exporters declined from a peak of 9¾ percent of total EU exports to the acceding countries in 1993 to about 8 percent in 2002.

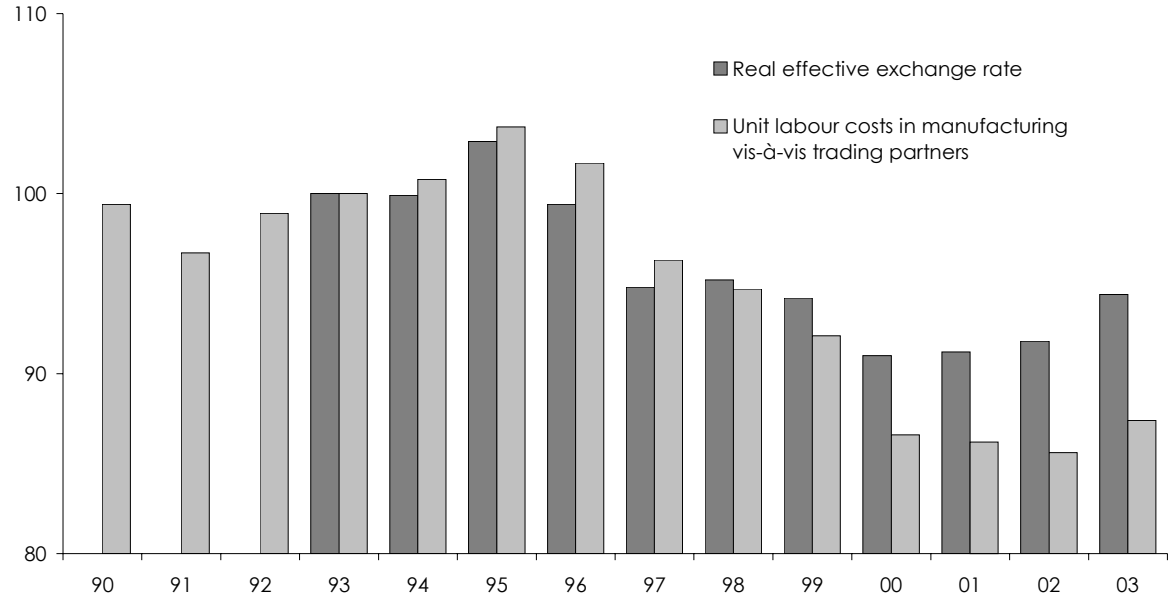
The positive effects of above-average export rates to the accession countries have resulted in a positive impulse on Austrian GDP of about 0.1 percentage point per year since 1994. However, the restrictive effects of German and Italian economic stagnation on Austrian exports outweigh the expansionary effects of the catch-up process in the acceding economies.

2.1.4. Price competitiveness of Austrian exports

In the short term, the international competitiveness of an economy is primarily determined by the relative development of prices and costs of domestic production and production of foreign competitors. However, in the medium and long term, non-price factors such as product quality are certainly more relevant than price factors.

Figure 2.7: Austria's cost and price competitiveness

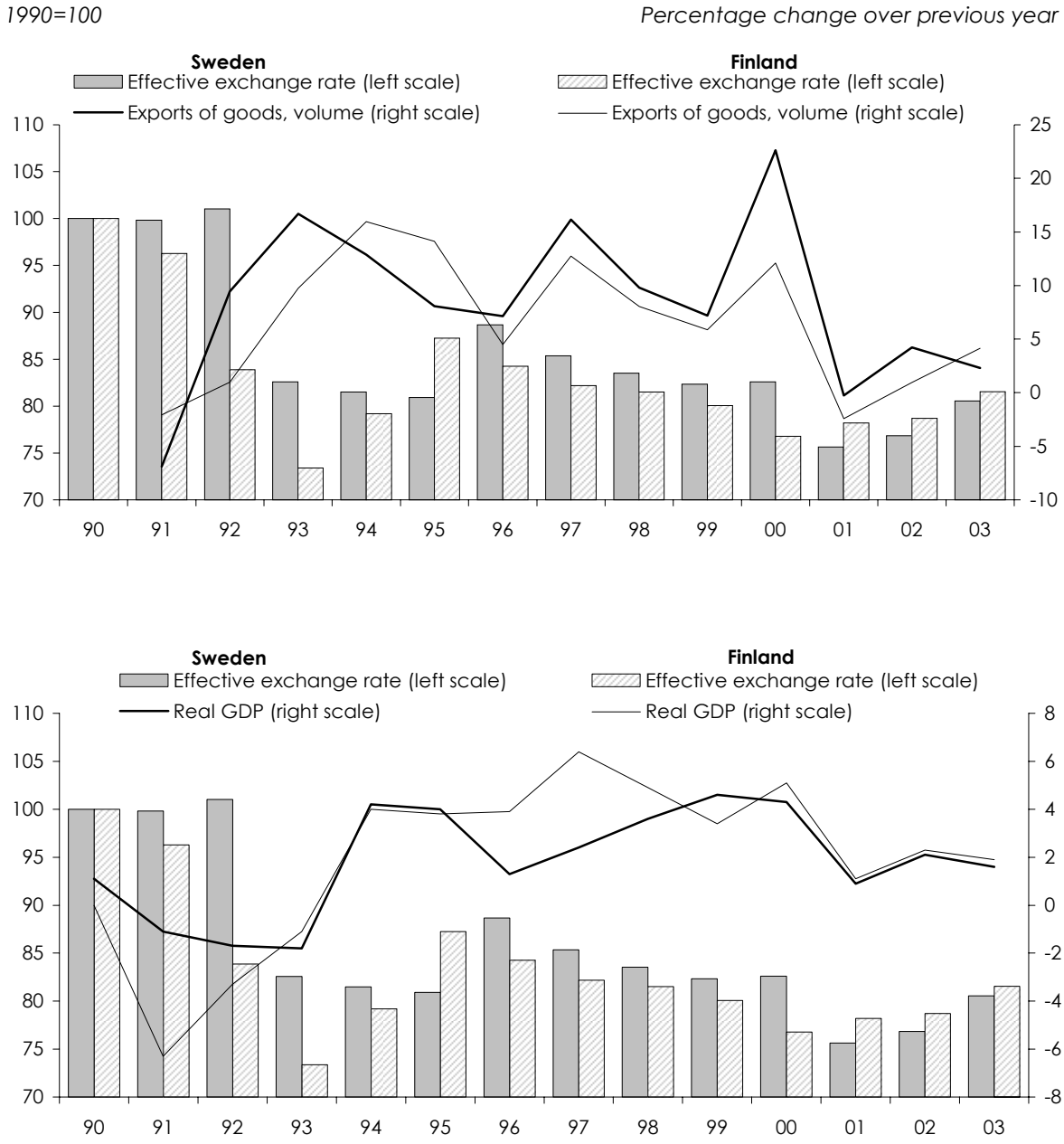
1993=100



Source: WIFO.

Price and cost competitiveness is mainly determined by exchange rates, relative productivity growth, relative labour costs and other cost variables. Several indicators to measure cost and price competitiveness exist, with the most important ones being real effective exchange rates and relative unit labour costs in manufacturing industries.

Figure 2.8: Effective exchange rate, export and growth performance in Sweden and Finland



Source: European Commission, IMF, WIFO.

Price competitiveness of Austrian exports has been improving considerably during the last decades. This has been primarily determined by marked increases in productivity in the manufacturing industry relative to trading partners while wage increases have been moderate. From 1995 to 2002, relative unit labour costs in manufacturing declined by 13 percent. However, there are also years where relative unit labour costs increase. This is – as in 1992/93, 1995 and 2003 – an effect of currency appreciation.

In the European Union, several economies, which are commonly seen as success stories during the second half of the 1990s, have been relying heavily on the expansionary effects of exchange rate devaluations at least in the early years of expansion. The pound sterling was devaluated by 15 percent in effective terms after it had left the European Exchange Rate Mechanism in 1992 and the Swedish Krona depreciated by 20 percent during this period. The Finnish Marka lost nearly 30 percent in effective terms between 1990 and 1993. Depreciation of the exchange rate is an effective instrument for expanding exports and gaining export market shares in the short run. An increase of price competitiveness leads to higher export growth and GDP growth. In Sweden and Finland, the currency depreciation clearly was a main element determining the recovery out of the deep recession of the early 1990s. In the medium term, inflationary effects via higher import prices are consuming the expansionary effects of the devaluation. Currency depreciation, especially if holding on in real terms for a longer period, does not only favour export growth, but also seems to make economies more attractive for international business investment.

2.1.5. Qualitative competitiveness of Austrian exports

While price and cost competitiveness of Austrian exports are high, qualitative competitiveness is often considered relatively weak. Unit values of Austrian exports are lower than the EU average. The lower level of unit values in export is primarily the result of a less favourable export structure. Technologically less developed and cheaper products have a higher share in Austrian exports. Deficits in the sectoral structure of the Austrian export industry are concerning the share of technology-intensive and skill-intensive product groups (*Hutschenreiter – Peneder,* 1997, *Peneder,* 2002). However, structural change towards high quality products can be clearly observed. Austria has been gaining market shares in trade with technology-intensive and skill-intensive products during the last decade.

2.1.6. High level of market shares in tourism

Tourism is of major importance for the Austrian economy. Exports in tourism have been increasing by 4½ percent in nominal terms and 1¼ percent in real terms per year from 1976 to 2003. Rising income in Austria, however, has been leading to marked increases in imports during this period as well (6½ percent in nominal terms and 3 percent in real terms per year). Tourism exports have been affected strongly during periods of currency appreciation. Although in comparison to manufacturing potential of productivity improvement is low, structural change has been high in recent years.

Austria still is holding high market shares in international tourism. In 2003, Austrian exports accounted for 5½ percent of total tourism exports in Europe. While rising slightly in recent years, market shares are considerably lower than in the second half of the 1970s (10½ percent).

2.1.7. Economic policy implications

1. Supporting policies in favour of stimulating GDP growth in the EU

The main factor determining Austrian exports is the development of aggregate demand in the trading partners' economies. An increase in GDP growth rates in the European Union is therefore of major importance for Austrian economic performance. Economic development in the European Union, in particular in the 'Euro-area', has been less than successful in recent years. It is therefore necessary to implement economic policy changes at the European level to improve growth performance.

The Lisbon strategy is the provision of a sound framework for EU targets of high growth without environmental degradation and full employment within socially cohesive societies. However, especially in the areas of economic growth and employment rates, the EU is far from meeting the Lisbon targets in 2010. This is due to the lack of strategy implementation at national levels as well as the weak economic performance of the Union in recent years.

The European Union clearly needs a short-term initiative providing the necessary impetus for an economic upswing. Existing shortages in Europe's infrastructure can be overcome by a boost in investment. The "European Growth Initiative" has been assembling a broad range of ideas, but again the political will for a timely implementation is lacking. Therefore, the Austrian government should set policy initiatives at the European level that are oriented towards

- making use of the existing room for manoeuvre in spending in the EU budget according to the current spending limits in 2004 to 2006,
- redirecting total expenditure between the various headings of the EU budget in order to reflect the political priorities for 2010 entitled growth, competitiveness and cohesion,
- enhancing a redirection of national spending towards the Lisbon objectives, and
- initiating "growth programmes" on the national level.

2. Stimulating foreign investment in the new member countries

- Demand for Austrian exports from the ten new member countries is becoming more and more important to the export industry. However, it is dampened periodically by restrictive policy measures set by the respective governments in order to fight current account deficits in these economies. Hence, potential demand for Austrian goods and services is considerably higher then actual demand.

In the long run, the current account barrier for higher growth of aggregate demand, GDP and imports in the new member states can only be overcome if capital inflows are expanding. A main element of capital inflows are transfers from European Union funds. EU membership will partly contribute to overcoming this growth barrier, but the new member countries are receiving by far less means from EU funds than underdeveloped economies have received in the past. The new member countries will be net receivers of EU payments by only about 1 percent of GDP in the period 2004 to 2006.

Table 2.4: Current account balances in the acceding countries

	As a percentage of GDP									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	Ø 1995/2002
Cyprus		–1.8	–5.2	–4.0	–6.7	–2.4	–5.2	–4.3	–5.3	–4.4
Czech Republic	–1.9	–2.6	–7.4	–6.1	–2.3	–2.9	–5.3	–4.6	–4.2	–4.4
Estonia	–7.2	–4.4	–9.2	–12.2	–9.2	–5.7	–6.0	–6.2	–12.3	–8.2
Hungary	–9.8	–5.3	–3.7	–2.1	–4.9	–4.4	–3.2	–2.1	–5.3	–3.9
Lithuania	–2.1	–10.2	–9.2	–10.2	–12.1	–11.2	–6.0	–4.8	–4.4	–8.5
Latvia		–0.4	–5.5	–6.1	–10.6	–9.6	–6.9	–9.7	–7.8	–7.1
Malta		–11.2	–12.2	–5.9	–6.2	–3.4	–14.9	–4.7	–4.7	–7.9
Poland	+1.0	+0.7	–2.3	–4.0	–4.4	–8.1	–6.3	–3.0	–3.3	–3.8
Slovenia	+4.0	–0.4	+0.2	+0.3	–0.6	–3.5	–3.0	+0.2	+1.8	–0.6
Slovakia		+2.0	–10.2	–9.3	–9.7	–5.7	–3.6	–8.5	–7.0	–6.5

Source: European Commission, WIIW.

Austrian economic policy should therefore be eager to influence EU policies in order to increase the investment of EU funds in the new member countries. The need for improvement is high, particularly in the areas railroad and road infrastructure as well as communication infrastructure. Austria will be the economy profiting most if higher capital inflows increase aggregate demand and subsequently growth in the new EU member countries.

Assuming that the growth margin between the "old" member countries and the "new" member countries doubles in the years to come from around 1¼ percentage points (in the period 1994 to 2002) to 2½ percentage points, Austria's exports will be boosted by about ½ percentage point and Austrian GDP growth by about 0.2 percentage point per year.

3. Improving the competitiveness of Austrian exports

In general, price and cost competitiveness of Austrian exporters is high and has been improving over the last decades (Figure 2.7). This is reflected in declining relative unit labour costs and rising market shares. In the past, problems of price competitiveness have occurred due to the appreciation of the Austrian currency vis-à-vis the currencies of trading partners. The establishment of the EMU has improved these currency fluctuation issues considerably.

There is still room for the improvement of Austrian exports competitiveness, in particular in qualitative terms. This is true for all areas of productivity improvement and a shift towards technologically more sophisticated products.

2.2. Investment rates and growth

During the last decades, investment activities in Austria have been continuously more dynamic than the EU average. From 1970 to 2003, aggregate investment grew in real terms on average by 2.6 percent p.a. in Austria, while growth rates in the EU amounted only to 1.8 percent. At 24 percent of GDP, Austria's investment ratio was remarkably higher than the

European average (21 percent of GDP). Intense investment activities can enhance economic growth in two ways: Firstly, through income effects helping to smooth the business cycle during periods of recession and contributing to growth over the short term; secondly, by means of capacity and the introduction of new technologies into the economy, supporting long-term growth. A high level of investment implies that demand can be kept high by continuously increasing capital stock.

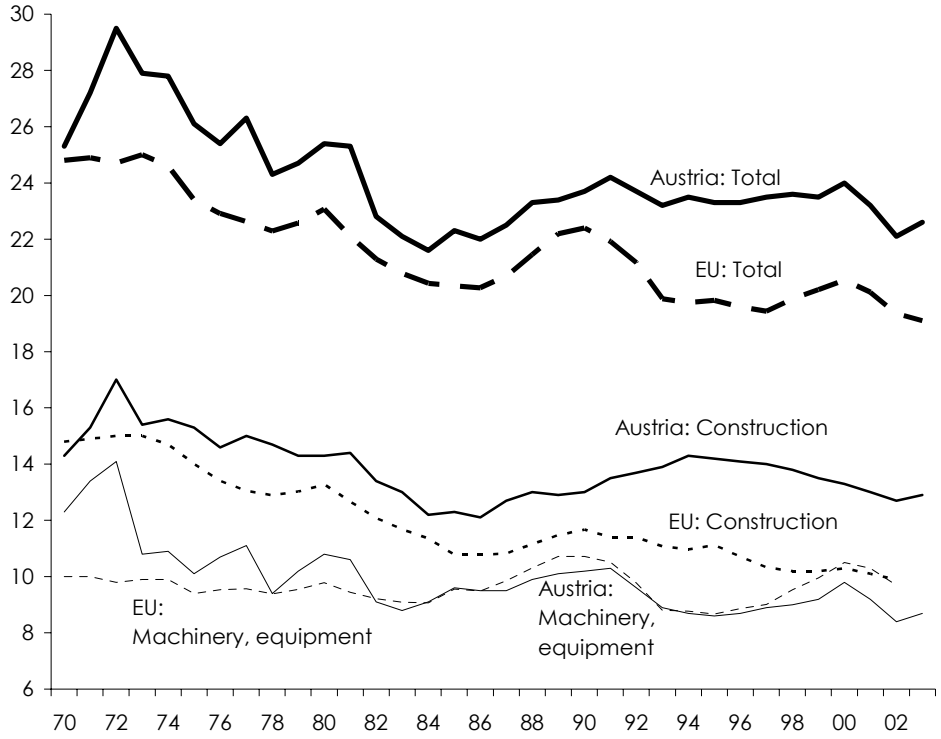
In comparison to the dynamic investment activities and high shares of investment in GDP, macroeconomic growth rates in Austria have been disappointing since the mid-1990s. One could expect that high investment expenditures initiate considerable multiplier and accelerator effects and therefore lead to intensified growth in GDP. The expansion of aggregate demand and output, however, was slower than the EU average, even though EU-average investment growth rates and investment ratios were much less intense. This points towards lower investment efficiency in a macroeconomic sense (*Scarpetta et al.,* 2000). While capital intensity of production increased enormously in comparison to other industrialised economies, capital productivity was on a decline (taking into mind that measurement of productivity of physical capital underlies massive theoretical and empirical problems).

The low efficiency is connected with the structure of investment, which is heavily biased towards investment in construction, while investment in innovation is relatively weak. At 14 percent of GDP, Austrian investment ratios in construction have been markedly higher than the EU average (11 percent of GDP). It increased considerably in the early 1990s, when intense immigration led to a hausse in housing prices and subsequently to increased public sector activity in housing programmes. Investment in construction clearly has positive macroeconomic effects in the short run, as multipliers due to low import contents are relatively high. Especially in the area of residential construction, long-term effects might be rather low.

Investment in machinery and equipment, on the other hand, and particularly investment in innovation and information technologies increase demand due to high import contents. Nevertheless, this kind of investment also positively affects exports and enhances structural changes, leading to higher growth rates in the long run. Only in the 1970s were investment ratios in machinery and equipment clearly above the EU average; since the end of the 1990s, they have fallen back considerably compared to the EU average. Therefore, a major macroeconomic problem in Austria lies in its investment structure: Austria is heavily biased towards investment in construction and housing in particular, while investment in innovation is relatively weak.

Figure 2.9: Gross Fixed Capital Formation

Percent of GDP



Q: Eurostat, WIFO.

2.3. Private consumption and economic growth

Consumption expenditure of private households is the most important component of macroeconomic demand in Austria, accounting for 57 percent of GDP in 2003. Growth rates of private consumption have been a main driving force for GDP growth. Between 1970 and 2003, Austrian consumption expenditure has been growing on average by 2.8 percent in real terms, which is clearly above the EU-average of 2.3 percent. Especially in the 1970s and in the 1990s, the relative growth advantage in consumption expenditure vis-à-vis the EU has been high (+0.7 percentage point per year and +0.5 percentage point, respectively). In recent years, expansion of private consumption has been dampened. From 2001 to 2003, the average growth rate of expenditures has been only 1 percent p.a. in real terms (1½ percent in the EU).

Growth of private consumption is generally rather a result of growth of GDP and disposable income than being a driving force of aggregate growth itself. However, there are two ways of an autonomous consumption-driven macroeconomic expansion. Low cyclical volatility of consumption expenditures can contribute to a stabilisation of aggregate demand during recessions. In addition, a marked decline in saving rates can fuel macroeconomic expansion even if disposable income is stable.

2.3.1. Low volatility of private consumption expenditures

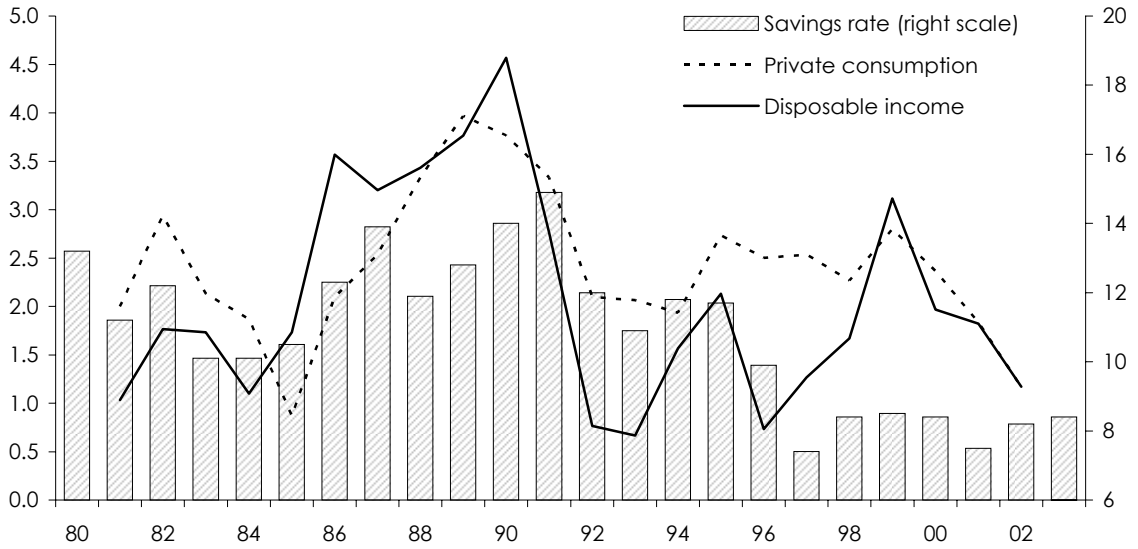
Growth in private consumption is primarily determined by the increase in disposable income, which in turn is favoured by high export growth, investment and a positive development on the labour market. In the last decades, real income growth of employees in Austria has been higher than in the European average.

However, the main characteristic of consumption expenditures in Austria in relation to the EU during this period has been the low volatility of growth rates (*Hahn – Walterskirchen,* 1992). Except for the years 1978, 1984 and 2001 (when a discretionary and restrictive fiscal policy was implemented), the standard deviation for consumption growth was 1.5 percentage points per annum. Several elements determine this low volatility:

- Employment and unemployment have been less volatile than in other economies (*Marterbauer – Walterskirchen,* 2001). Labour supply and productivity typically move procyclically with economic growth in Austria. In recession periods, labour supply and productivity have been declining, employment and unemployment have been staying relatively stable (labour hoarding), while in boom periods labour market changes have been dampened as well. Therefore, mass income in Austria has been less volatile than in other economies.
- The comprehensive welfare state has been supporting a stable pattern of consumption expenditures in several ways. Firstly, the general welfare state has been causing a high share of transfers in mass income. This dampens the volatility of purchasing power of private households. Secondly, the welfare state together with a low level of unemployment has been contributing to the stabilisation of consumer expectations. This allows consumers to spend even in (short) periods of a subdued disposable income.
- In Austria, the savings rate of private households has been developing procyclically. Therefore, it is a further element dampening the volatility of disposable income during the business cycle. During recessions or due to restrictive fiscal policy, the savings rate has been declining markedly, while private consumption expenditures remained stable. During boom periods or due to expansionary fiscal policy, the savings rate has been increasing. The savings of private households in Austria turn out to be a residual rather than a planned decision.

Figure 2.10: Income, consumption and savings rate of private households in Austria

Percentage change, volume
3-year moving average *Percent of disposable income*



Source: OECD, WIFO.

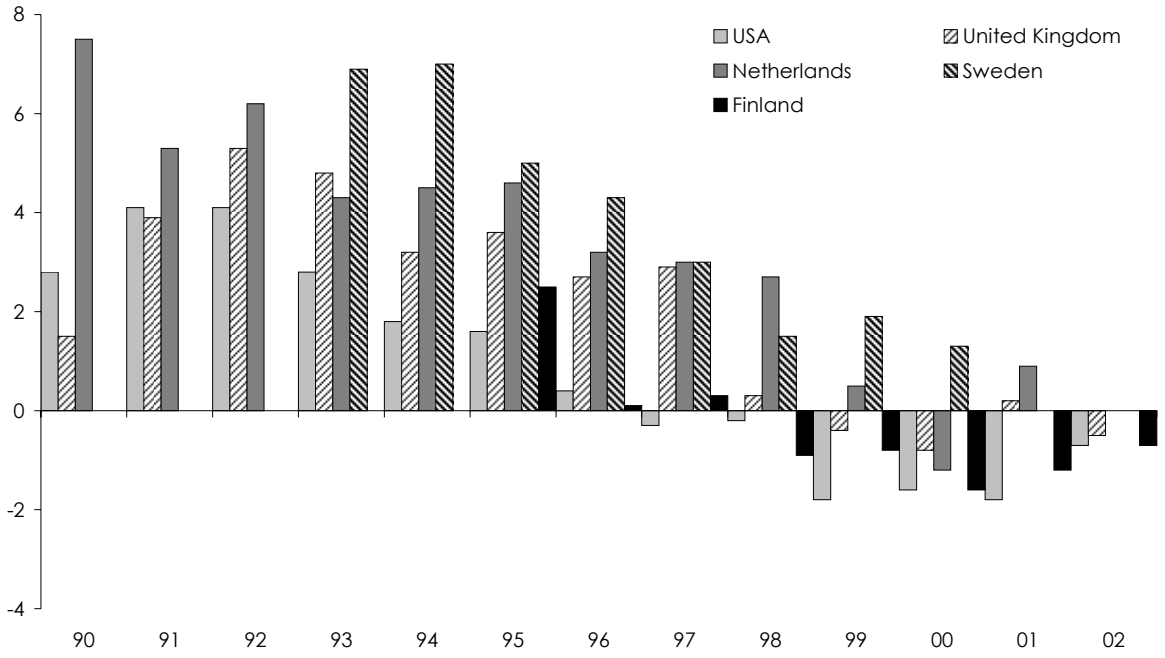
2.3.2. Declining savings rates of private households as a main element of success stories

Savings rates of private households in the various EU economies showed different patterns during the last decades. In Austria, the savings rate fluctuates procyclically. Several other countries have been facing a medium-term decline in the savings rate. It is remarkable that during the 1990s, those economies facing a rather strong GDP growth also featured an above-average expansion of private consumption expenditures. High growth rates of private consumption go hand in hand with a continuous decline in the financial balance of private households.

By definition, the financial balance of private households is equal to the financial balance of the business sector, the public sector and the foreign sector. A change in the financial balance of private households therefore requires as a matter of identity equivalent counterpart changes in the financial balances of the other sectors. The idea of financial balances provides a useful framework for an empirical analysis of macroeconomic performance. A decline in the households' savings rate will favour private consumption and lead to an increase in growth of GDP and business profits as well as a decline of the public sector deficit (*Guger – Walterskirchen,* 1988).

Figure 2.11: Financial balance of private households

Percent of GDP



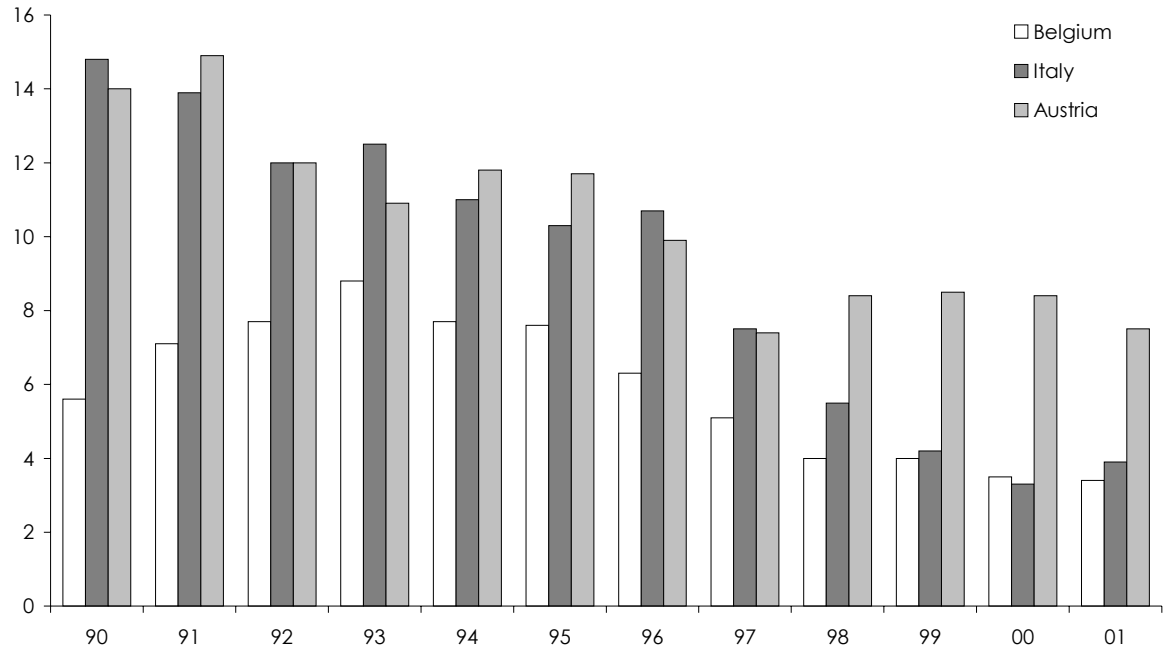
Source: OECD, National Accounts, Volume II.

Those economies facing above-average growth rates of GDP during the 1990s were selected as role models in international studies. First of all, the United States after the recession in 1991, but also the UK, Sweden and Finland are recognized as being successful – all of them of course only after they overcome the deep recession of the early 1990s. Moreover, in the 1990s (but not in recent years), the "Polder model" in the Netherlands was praised as an economic policy model.

Certainly, all of these economies and their success stories have been characterised by numerous individual determinants. Nevertheless, it is remarkable that all of these economies also have some common characteristics, with one of them being the decline in the financial balance of the private households. In the USA, the financial balance of the private sector during the boom period declined from +4 percent of GDP in 1992 to –2 percent in 1999. In the UK, the decline was also 6 percentage points between 1992 and 2000. The Netherlands faced a decline of the financial balance of households by 9 percentage points from 1990 to 2000. In addition, the Scandinavian economies, which were economically successful during the second half of the 1990s, saw a decline of 6 percentage points in Sweden between 1994 and 2000 and 4 percentage points in Finland between 1995 and 2000, respectively.

Figure 2.12: Financial balances of private households in Austria, Belgium and Italy

Percent of GDP

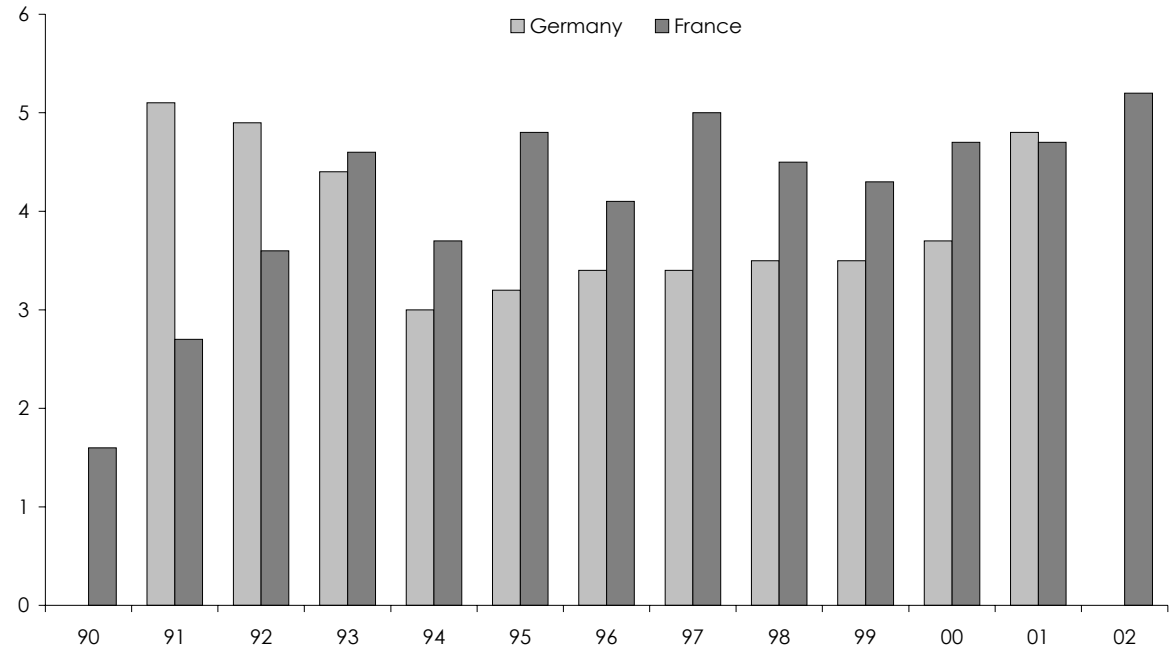


Source: OECD, National Accounts, Volume II.

In Italy, the decline of the financial balance of private households has been marked as well. The surplus fell from 15 percent of GDP in 1990 to 3 percent in the year 2000. This allowed for successful budget consolidation without too marked negative effects on economic growth. In Italy, the financial balance of the public sector improved from 12 percent of GDP in 1990 to ½ percent in 2000. The picture for Belgium is very similar. The decline in the financial balance of households by 5 percentage points between 1993 and 2001 was the main collateral against the decline in public sector deficits. In Austria, a decline in the savings rate also dampened the negative economic effects of budget consolidation in the years 1996-97 and 2001.

In recent years, some economies have been facing an increase in the financial balance of private households. In France and Germany, the financial balance has been rising by about 1 percentage point from 1999 to 2003.This is unusual in periods of moderate growth when a decline would be standard. The increase in the financial balance of private households has been contributing considerably to the stagnation of GDP in this period.

Figure 2.13: Financial balances of private households in Germany and France
Percent of GDP



Source: OECD, National Accounts, Volume II.

2.3.3. *Real estate prices and macroeconomic development*

In recent years, the effects of stock market volatility on private consumption and investment have been an area of major concern in economic theory and economic policy. Especially in the US, it has been widely reflected that changes in wealth are associated with changes in consumption. The studies on wealth effects, however, mostly concentrate on stock values (*Case – Quigley – Shiller,* 2001).

A simple comparison of the development of residential property prices and growth rates of private consumption in EU economies shows a high correlation (*Marterbauer – Walterskirchen,* 2003). In recent years, consumption has been growing above average in economies with rising real estate prices. In many European countries, housing markets have been boosted partly by low short-term and long-term real interest rates. Rising housing wealth has been one of the determinants of a decline in saving rates in several countries. On the other hand, in recent years real estate prices have been falling slightly in Germany. This is likely to affect the construction industry that has been remarkably weak in Germany, but not private consumption.

In recent years, positive contributions of rising housing wealth to growth in private consumption seem to have influenced aggregate demand in several countries considerably.

A positive effect on GDP growth in years of rising housing prices, however, will be mirrored by a similar negative effect during years of declining housing prices. In many countries, the level of housing prices as well as the current increase in housing prices does not seem to be sustainable, with real estate markets probably being significantly overvalued. The bursting of the housing bubble could very well lead to marked macroeconomic disturbances as the experience of the early 1990s in the UK or the Scandinavian economies shows.

Figure 2.14: Residential property prices and private consumption

Average annual growth rates 1995/2002

Source: BIS, OECD.

Table 2.5: Real estate prices and consumption
Average annual growth rates 1995-2003

	Residential property prices	Real private consumption	Real investment in housing
Ireland	+14.5	+6.5	+9.9
UK	+11.8	+4.1	+2.2
The Netherlands	+11.2	+3.2	+1.6
Spain	+ 9.8	+3.2	+5.8
Finland	+ 8.2	+3.1	+5.5
Sweden	+ 8.0	+2.5	+4.2
Denmark	+ 7.0	+1.2	+2.1
Belgium	+ 5.2	+2.0	+2.3
France	+ 4.8	+2.1	+1.8
Italy	+ 3.7	+2.1	+0.7
Germany	± 0.0	+1.3	–1.8

Source: BIS, OECD.

2.3.4. Economic policy implications

1. Declining savings rate

A decline in the savings rate of private households is a common characteristic in economies that have been facing high growth rates of GDP during the 1990s. The determinants of the decline in the savings rate are of course manifold:

- Rising real estate prices and housing wealth have been an important determinant of the decline in the savings rate in several economies (USA, UK, Scandinavian countries; for further details see the following chapter).
- In Scandinavian countries, the drastic increase in unemployment and the high income uncertainties in the early 1990s boosted precautionary savings, resulting in a considerable increase of the savings rate and a drop in current consumption during this period. With the cyclical upswing, the return of income growth and the decline in unemployment, the savings rates was declining again. This countercyclical development of the savings rate is typical for the Swedish experiences from the second half of the 1980s to end of the 1990s.

Neither rising real estate prices, nor overcoming precautionary saving seems to be a solid basis for a sustainable reduction of the savings rate of private households. Both elements have short- to medium-term expansionary macroeconomic effects, but there is always the possibility of a turnaround of the savings rate, implying negative consequences for aggregate demand. Especially the economies boosted by speculative bubbles on housing markets can easily face severe macroeconomic distortions as soon as these bubbles start to burst.

With respect to the very different trends in the savings rates of private households, it is remarkable that the Euro barometer surveys show considerable differences in general household expectations between EU economies. While people in Germany, France and Italy feel insecure and dissatisfied, people in the Nordic countries express high satisfaction and optimism. This can be connected to the saving behaviour of private households. A pessimistic attitude towards future economic developments can result in precautionary saving, while an optimistic outlook could lead towards a decline in the savings rate.

Sustainable ways of reducing high savings rates of private households in the medium term could be (*Steindl,* 1979):

- Stimulating investment of private households, in particular in the housing sector,
- Stabilising consumer expectations,
- Redistributing income to lower income groups with low savings rates. The savings rate of the lowest third of the income distribution is typically very moderate, whereas the highest income groups have a savings rate of more than 50 percent in the short term. A redistribution of income from high-income groups to low-income groups would therefore result in a decline of the average savings rate and an increase in aggregate consumption.

Table 2.6: Saving rates of income groups in Austria

	Marginal, short term	Average, long term
Lower terzile	0.2	– 0.2
Medium terzile	0.5	0.0
Upper terzile	0.6	0.2

Source: Statistik Austria, WIFO.

2. Procyclical development of the savings rate

In Scandinavian countries, the savings rate has been developing countercyclically during the last decades. This has posed major macroeconomic problems. During recessions, private households tend to increase their savings due to precautionary motives and therefore intensify the lack of aggregate demand. In boom periods, private households tend to increase consumption rates, causing overheating pressures.

In Austria, on the other hand, the savings rate typically fluctuates procyclically with the business cycle. Hence, private consumption expenditures are an important stabilising element during the cycle. Stable consumer expectations are a main determinant of a procyclically fluctuating savings rate. Elements of an economic policy aimed to stabilise consumer expectations can be:

- countercyclical fiscal policy,
- successful employment policies leading to low rates of unemployment,
- the welfare state.

2.4. Low cyclical volatility and economic growth

A main characteristic of Austrian macroeconomic development is the relatively low variability of output. Recessions in particular have been less deep in Austria than in other European economies. During the years of general recessions throughout the EU, the Austrian economy had gained a growth advantage that lasted for several years and had a positive effect on the long-term performance of the labour market. Rather moderate recessions and less volatile cyclical development seem to have a positive impact on long-term growth rates.

Low output volatility, which contributes to low unemployment rates in the long term, has been a main element of Austrian policy orientation during the last decades. "Austrokeynesian" economic policy has been explicitly oriented towards a stabilisation of investor and consumer expectations in order to stabilise the business cycle and to improve economic growth in the long term (*Seidel,* 1982, *Tichy,* 1986). Demand-oriented macroeconomic policy, namely fiscal, monetary and wage policies, have been important policy instruments:

- The most important stabilising element of fiscal policy has been the built-in flexibility of the federal budget and the comprehensive welfare state. The extensive system of tax incentives and subsidies has been an important instrument of discretionary fiscal policy in order to stabilise business expectations and foster investment.
- Hard currency policy, pegging the Austrian schilling to the German mark, used to be a tool for the stabilisation of exporter and investor expectations.
- Macroeconomically oriented wage policy within the system of economic and social partnership contributed to the stabilisation of consumer and entrepreneur expectations.

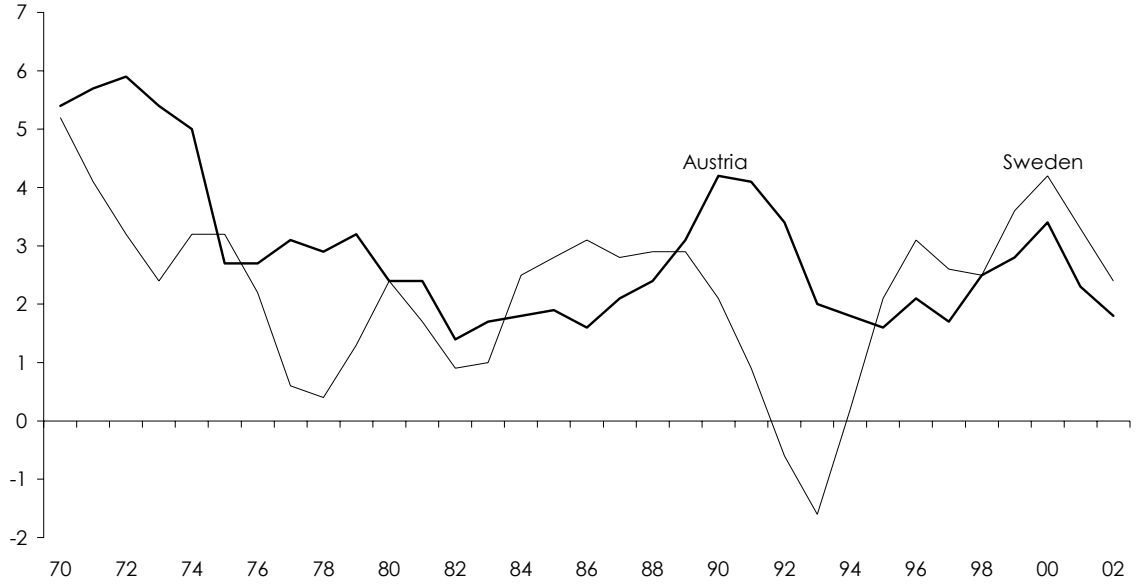
Austria's participation in the European Monetary Union has intensified the stabilising effects of hard currency policy. Macrooriented wage policy in general was preserved, but the system of social partnership has lost some influence in recent years. Fiscal policy lost its countercyclical bias in the second half of the 1990s. In recent years, fiscal policy seems to be characterised rather by a political business cycle.

In Sweden, output variability was low in the 1950s and 1960s. The comprehensive welfare state was the main stabilising factor during this period. Since the 1970s, volatility has been increasing. During the 1980s and 1990s, the Swedish economy has been characterised by heavy macroeconomic fluctuations, culminating in the deep recession of the early 1990s and a strong upswing thereafter. Increasing volatility of the cycle can be seen in relation to:

- numerous currency depreciations, especially in the 1970s and early 1980s,
- the bursting of the housing bubble in the late 1980s, and
- the procyclical development of the savings rate of private households.

Figure 2.15: Real GDP growth in Austria and Sweden

3-year moving average



Source: OECD, WIFO.

The cyclical volatility of macroeconomic performance can be quantified by the standard deviation of economic growth. During the very long period from1960 to 2003, the standard deviation of real GDP growth is rather similar in Austria (1.9) and Sweden (2.1). In the last two decades (1980 to 2003), however, the standard deviation of economic growth has been much lower in Austria (1.3) than in Sweden (1.9).

Economic policy implications

Stabilising the fluctuations of the business cycle could be a major task for macroeconomic policy in order to foster economic growth and prevent an increase in unemployment in the long term. Stabilisation of investor and consumer expectations shall be at the centre of policy efforts. Within a monetary union, fiscal and wage policies remain important elements of stabilisation.

Automatic stabilisers of the public sector, especially of the welfare state, form main elements of a stability-oriented fiscal policy. Fiscal policy shall first allow automatic stabilisers to work fully in recessions as well as in boom periods. Furthermore, stimulating public and private investment during economic crises proves to be an efficient instrument for the stabilisation of the business cycle. Last but not least, discretionary fiscal policy shall avoid a procyclical stance.

2.5. Conclusions

Austria's economy was facing positive growth margins vis-à-vis the other EU economies in the 1970s and early 1990s. However, it has been losing ground in international comparisons of economic growth in recent years. This is the case even though Austria as a location for

production is still favourable. Net contribution of external demand to GDP growth has been high, Austrian exporters are gaining market shares, the current balance has been improving, and foreign direct investment is lively, yet competitiveness can be further improved in qualitative terms. However, internal demand turned out to be weak in the last decade. While still being high, the investment ratio, faces considerable deficits in its structures, and investment growth has been slow in recent years. Growth in consumption has been moderate, especially in comparison to economies that have been able to lower the savings rate of private households. Relatively low cyclical volatility has been an important characteristic of the macroeconomic development in Austria. Together with countercyclical fiscal policy, stabilising expectations of investors and consumers can contribute to a more stable development of the business cycle and higher long-term growth rates of GDP. This chapter discusses the contribution of various aggregates of demand to economic growth and developing economic policy conclusions on a macroeconomic level.

Zusammenfassung

Die österreichische Wirtschaft wies in den siebziger und der ersten Hälfte der neunziger Jahre einen Wachstumsvorsprung gegenüber dem EU-Durchschnitt auf. Dieser Vorsprung ist seit Mitte der neunziger Jahre verloren gegangen. Dies obwohl vom Außenhandel deutlich stärkere Wachstumsimpulse ausgingen, als gemeinhin angenommen, und die österreichischen Exportunternehmen auf wichtigen Märkten Anteile gewonnen haben. Seit Beginn der neunziger Jahre kann bis zu ein Drittel des heimischen Wirtschaftswachstums durch den Nettobeitrag des Exports erklärt werden. Während der durch die deutsche Vereinigung ausgelöste Nachfrageboom zu Beginn des vergangenen Jahrzehnts auch der heimischen Wirtschaft kräftige Impulse verliehen hat, hat die Wachstumsschwäche in Deutschland seit 1994 etwa 1/3 Prozentpunkt BIP-Wachstum pro Jahr gekostet. Dies konnte durch den langsamen Aufholprozess in den Beitrittsländern nur zu einem kleinen Teil ausgeglichen werden. Gelingt es der EU-Wirtschaftspolitik durch gezielte öffentliche Investitionen, den Aufholprozess der Beitrittsländer zu beschleunigen, so ergeben sich daraus erhebliche Wachstumspotentiale für die heimische Wirtschaft.

Für die Wachstumsschwäche in Österreich spielt die verhaltene Dynamik der Inlandsnachfrage eine wesentliche Rolle. Die Investitionsquote liegt noch immer über dem EU-Durchschnitt, obwohl die Investitionen zuletzt merklich zurückgegangen sind. Hohe Investitionen können die Wirtschaft ankurbeln, allerdings gilt es, ihre Struktur zugunsten von Innovation und Informationstechnologien zu verbessern. Der Konsum der privaten Haushalte wuchs in der Vergangenheit deutlich rascher als im EU-Durchschnitt, allerdings blieb die Expansion seit Mitte der neunziger Jahre verhalten, vor allem im Vergleich zu jenen Ländern, in denen der Sparanteil am verfügbaren Einkommen merklich zurückging. Höhere Investitionsanreize für private Haushalte und eine stärkere Egalität der Einkommensverteilung können zu einer nachhaltigen Reduktion der Sparquote und kräftigerer Expansion des privaten Konsums beitragen.

Die relativ stabile Entwicklung der Konjunktur bildete ein wesentliches Charakteristikum der österreichischen Wirtschaft. Die Stabilisierung der Erwartungen von Investoren und privaten Haushalten sowie ein aktiver Einsatz der Geld- und Fiskalpolitik können wesentliche Beiträge

zur Dämpfung der Volatilität der Konjunktur und zu überdurchschnittlichem Wirtschaftswachstum im langfristigen Vergleich leisten.

3. Competition, Competition Policy and Economic Growth

MICHAEL BÖHEIM

3.1. Introduction and motivation

In this chapter, we investigate the link between competition, competition policy and economic growth. In recent years, a number of OECD/EU countries have implemented a wide range of structural and regulatory reforms. These reforms include deregulation and liberalisation of product markets (particularly telecommunications, utilities and financial services) as well as privatisation of public enterprises (*Nicoletti* et al. 2001). Despite several years of intense regulatory reforms, the "friendliness" of the regulatory environment towards product market competition still varies substantially across the OECD countries. The United Kingdom, Ireland and the United States appear to be the least restrictive overall regulatory environment, while the environment in Italy, Greece and Norway is still characterised by rigid regulations (*Nicoletti* et al. 2000; 2001). In the literature, there is universal agreement that regulatory and structural reforms in the product market increase MFP growth (*OECD* 2002; *Scarpetta* et al. 2002; *Nicoletti* et al. 2001; for a concise review see also *Ahn* and *Hemmings* 2000). For instance, using a panel data set of OECD countries for the period 1982-1998, *Nicoletti* et al. (2000) find that a significantly negative correlation between MFP growth and a general indicator of product market regulation exists.

3.2. Theoretical background

During the intense discussion whether competition fosters or hinders growth – a controversy that originally dates back to the early 1940s – two 'competing' theories have been developed and ambiguous evidence found on the efficacy of competition. After sixty years of research, economics is now at least able to specify the conditions in order that competition will produce better economic performance or, alternatively, cause deterrence of innovation.

Market competition takes place as a "process of creative destruction" (*Schumpeter* 1942) and can be interpreted as a "search and discovery process" (*von Hayek* 1968). Competition as a perpetual search and discovery process ensures that producers are forced to continuously adapt their products to changing consumer preferences in order to keep their customers. Existing products and processes are challenged by innovations and will be driven out of the market if innovative products and processes fit customer needs better.

Based on the insights gained from the theoretical model of perfect competition (cf. Box), it has been widely recognized that competition is an important force in achieving allocative efficiency, providing incentives for the efficient organisation of production, and pushing forward innovation activities.

According to this line of thought, we can identify three forms of incentives for improved efficiency provided by competition (cf. *Armstrong, Cowan and Vickers* 1994).

BOX: Microeconomic foundations of competition policy

According to the standard microeconomic model, perfect competition guarantees the efficient allocation of scarce resources. Since equilibrium prices are set equal to marginal cost, producers are not able to earn a profit higher than the normal rate of return. Otherwise, consumers would switch immediately to alternative suppliers and producers would loose all their customers. The efficient allocation of resources means that total welfare (as the sum of consumer and producer surplus) is maximised. Consumers profit immediately through lower prices, better quality and more product variety compared to any situation with imperfect competition (oligopoly, monopoly). The expected long-term effects of competitive markets on the macroeconomic level would be higher levels and/or higher growth rates of innovation, productivity and overall economic performance.

Since rational producers, however, will strive for higher profits, this competitive equilibrium proves not to be stable – neither in theory nor in real world markets. To foster corporate growth and raise profits above the normal level, producers principally face two alternative routes: on the one hand, the supply of innovative products and, on the other hand, anti-competitive behaviour. Which route the market participants will choose depends crucially on the incentives they face. Given the theoretically derived micro- and macroeconomic benefits of (perfect) competition, society certainly does have a vital interest in the reduction of incentives for anti-competitive behaviour. Since the market mechanism cannot automatically deliver perfect competition in real world markets, public competition policy acts as an instrument to correct this kind of market failure. Therefore, the role of competition policy can best be viewed as an attempt to make the latter alternative as unattractive as possible.

Competition economics based on this simple model suggests that this can best be done by trying to "implement" (i.e. approximate) the equilibrium solution of perfect competition in real world markets. This recommendation, however, might not always be "best practice", because due to specific industry characteristics (e.g. technology, economies of scale, economies of scope and entry barriers), oligopolistic market structures could be induced.

First, competition tends to 'select' more efficient firms at the expense of less efficient ones, thus resulting in overall improvements in productivity. In an adaption of the core principles of Darwin's natural selection theory, it is argued that competition drives enterprises to better adapt to their environment because of threats to their survival. Firms with market power are shielded from this kind of selective competition and can therefore survive without constant efforts to enhance their efficiency. The precise mechanism by which competition fosters the 'survival of the fittest" depends upon the nature of the competitive process (cf. Vi*ckers* 1995), yet the conclusion is quite robust.

Second, competition provides managerial incentives for the reduction of organisational slack and X-inefficiency (*Leibenstein*, 1966), thereby improving productivity and corporate performance. Darwinian tradition emphasises that competition drives inefficient firms out of the market. The higher the degree of competition, the stronger the pressure to reduce organisational and managerial slack.

Third, one can expect that sharpened incentives (see above) may well lead to productivity improvements, which may be (partly) induced by increased efforts being put into R&D and innovation. The theoretical support for the proposition that competition fosters innovation exists, but this is yet far from conclusive.

A series of studies in the tradition of principal-agent theory show that competition induces a firm to be more efficient by reducing its agency problems (*Hart* 1983, *Nalebuff and Stiglitz* 1983, *Mookherjee* 1984, *Willig* 1987, *Hermalin* 1992).

Aghion et al. (2001) demonstrate in a model with step-by-step innovation that competition has a positive effect on growth by pointing out that a technological leader in a more competitive industry earns higher profits relative to other firms in the industry due to the 'selection effect' of market competition. In this institutional setting, a strong motive for innovation and/or investment in R&D comes from the possibility to escape from competition with 'neck-to-neck' rivals ("escape-competition effect").

Empirical evidence for the Darwinian assumption that competition forces firms to innovate and to be more efficient, thereby raising productivity and enhancing growth, is quite broad (e.g. *Nickell* 1996, *Blundell et al.* 1995, *Geroski,* 1990, 1995).

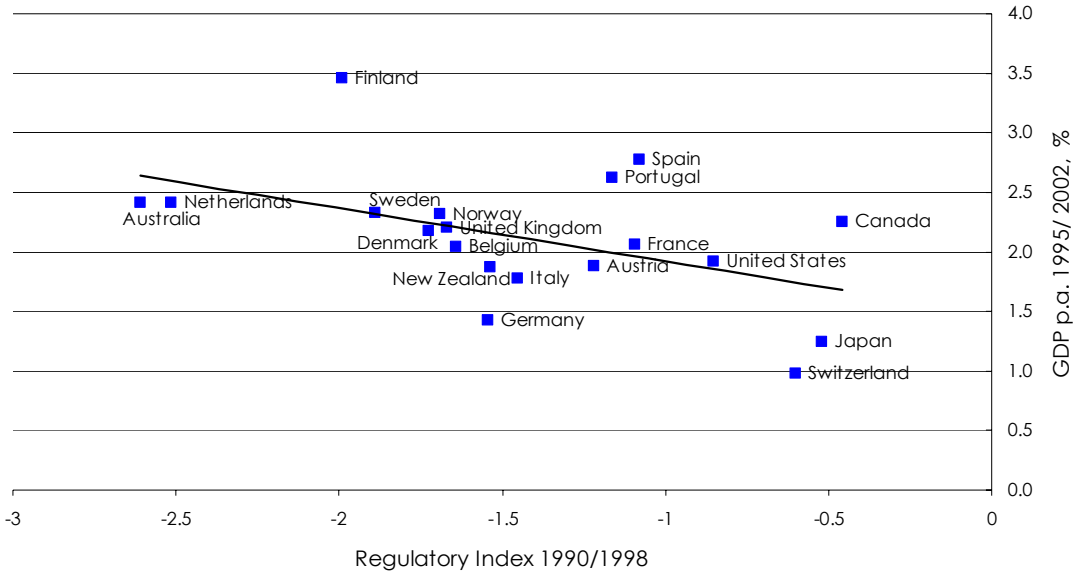
Porter (2000) found empirical evidence for both the intensity of local competition and the effectiveness of national antitrust policy[12] having a positive relationship with the level as well as the growth rate of GDP per capita. The argument that more competition has a positive impact on growth is also confirmed by the fact that the OECD countries having started to deregulate network industries most ambitiously in the early 1990s enjoyed the highest GDP growth per capita in the late 1990s (Figure 3.1)

Despite the strong empirical support for a positive relationship the efficacy of competition on growth remains a controversial issue. According to *Schumpeter* (1942), an atomistic firm operating in a perfectly competitive market may be a perfect vehicle for static resource allocation, but a large firm with substantial market power is the most powerful engine of progress and long-run expansion of total output.

Schumpeter (1942) identified two effects of market power on innovation. First, he argued that expected ex-post market power, even though it would be transient, induces firms to have an incentive to innovate. If firms expected excessive rivalry after the innovation, they would have little incentive for innovation. Second, *Schumpeter* also argued that an ex-ante oligopolistic market structure and the possession of ex-ante market power are favourable to innovation. This is because it is easier for firms to predict rivals' behaviour under an oligopolistic market structure and therefore there is less uncertainty of excessive rivalry. *Schumpeter* thought that profit from ex-ante market power could serve as a source of internal financial resources for innovation activity by implicitly assuming an imperfect capital market (cf. *Cohen and Levin*, 1989).

[12] Since 'intensity of local competition' and 'effectiveness of national antitrust policy' are both qualitative 'soft indicators' that have been constructed on the basis of interviews with a sample group of (national) business managers, any far-reaching conclusions derived from these indicators have to be treated with due care.

Figure 3.1: Higher growth through deregulation



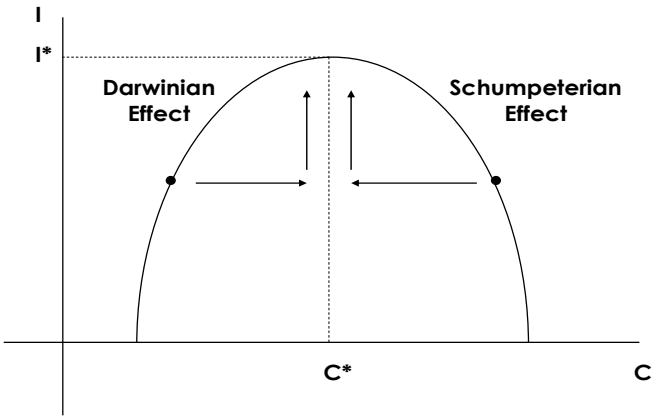
By further exploring Schumpeter's basic propositions in the context of endogenous growth theory (e.g. *Aghion–Howitt* 1992, *Grossman–Helpman* 1991, *Romer* 1990), no compelling evidence for the negative trade-off between competition and growth was found. Schumpeter's results rather proved to be very sensitive to the underlying assumptions (Cf. *Aghion – Howitt* 1997).

In an attempt to "reconcile" both lines of argumentation, recent research in the Schumpeterian tradition provides evidence that beginning with the monopoly, competition enhances efficiency (only) until a certain level of market concentration is reached, while competition hampers efficiency if it is too intense. This non-monotonic relationship between competition and efficiency (or productivity and growth) is known in the literature as the 'Inverted U-Shape' hypothesis. According to *Aghion et al.* (2002), the relationship between product market competition and innovation is inverted U-shaped because at low levels of competition, the "escape-competition effect" tends to dominate while the Schumpeterian effect tends to dominate at higher levels of competition.

The logic of the "inverted U" implies that the effects of a relative change in competition intensity on growth depend on the current level of competition ("Laffer-curve" problem; Figure 3.2). The combination of Darwinian and Schumpeterian effects leads to an inverted U-relationship between competition and growth.

By using data for UK manufacturing industries, *Aghion et al.* (2002) found that negative "Schumpeterian" effects of competition on innovation (and growth) only materialise at very high competition intensity levels (Figure 3.3). According to this research, the *escape-competition effect* is strongest in industries with a small technology gap ("neck-and-neck" industries) and the *appropriability effect* is strongest in industries with a large technology gap.

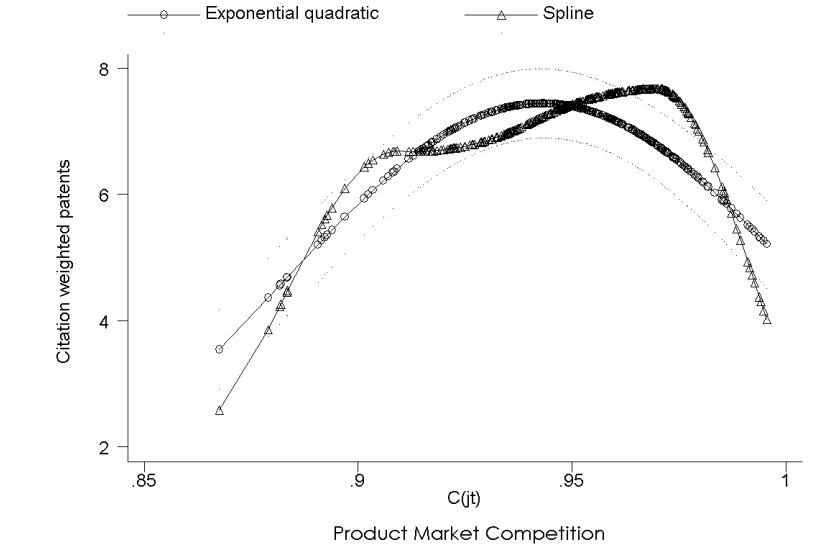
Figure 3.2: The inverse-U



Source: Aghion-Bloom-Blundell-Griffith-Howitt 2002, WIFO.

However, in case of really strong competition, not too many industries will remain neck-and-neck (composition effect; Figure 3.4). On the other hand, weak competition leads to many industries remaining neck-and-neck, where the escape-competition effect dominates, while strong competition unlevels them, making the appropriability effect dominate.

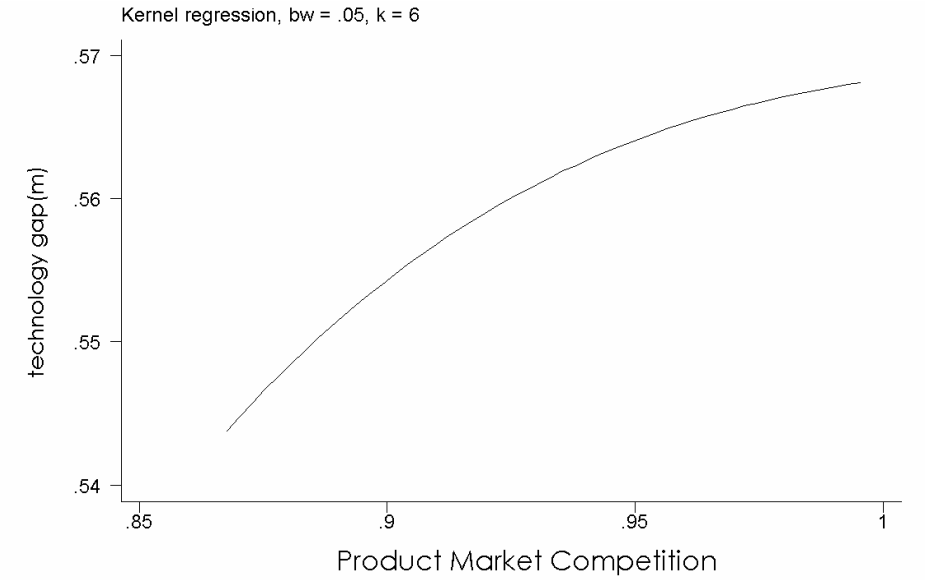
Figure 3.3: Empirical evidence on the inverse-U



Source: Aghion-Bloom-Blundell-Griffith-Howitt 2002, WIFO.

Empirical evidence for the "inverted U" is quite broad and strong (e.g. *Scherer* 1967, *Scott* 1984, *Levin et al.* 1985, *Caves and Barton* 1990, *Green and Mayes* 1991, *Caves et al.* 1992, *Aghion et al.* 2002).

Figure 3.4: The composition effect



3.3. Product Market Regulation and Competition: Empirical Evidence for Austria

Empirical measurement of competition draws on a broad array of indicators including similarities and convergence of price structures, differences in price levels as well as estimates of the levels and trends of profit margins. In influencing the competition intensity of a market by determining entry costs, product market regulation can serve as an additional competition indicator.

Since the introduction of the OECD product market regulation index (PMR) in the late 1990s (cf. *Nicoletti and Scarpetta*, 1999), a reliable source for international comparisons of regulatory reforms is at last available. In international country rankings of economy-wide product market regulation, Austria takes a place in the midfield with more or less average indicator scores (Table 3.1; *Nicoletti and Scarpetta*, 2003). Furthermore, the general picture drawn by international comparisons shows that like in other small countries, concentration indices are generally above average in Austria (*OECD*, 2003c).

Price-cost margins are estimated to be higher in Austria than the average of other OECD countries in some industries, but lower in others (see Figure 3.5). Above-average mark-ups can be found mainly in non-manufacturing industries such as retail distribution, hotels and restaurants. In manufacturing, the only sector with particularly high mark-ups is the steel industry ("basic metals"), where public ownership has traditionally been high and where Austrian companies (e.g. Voestalpine steel, Boehler-Uddeholm) are world market leaders and

quality suppliers through successful product and process innovation. Lower than average mark-ups in some network industries (telecommunication, electricity, gas and water supply) point to successful deregulation in Austria (*OECD*, 2003c).

Table 3.1: Ranking product market regulation

	Nicoletti et al. (1999)		*Kaufman et al. (1999)*		*Pryor (2002)*	
	Scores	Ranks	Scores	Ranks	Scores	Ranks
Australia	0.24	3	0.30	8	0.40	12
Austria	**0.49**	**8**	**0.37**	**10**	**0.39**	**11**
Belgium	0.80	17	0.50	17	0.74	18
Canada	0.54	11	0.41	14	0.24	6
Denmark	0.50	9	0.19	7	0.38	10
Finland	0.67	14	0.08	5	0.00	1
France	0.88	18	0.60	18	0.78	19
Germany	0.52	10	0.39	11	0.31	7
Greece	0.97	20	0.74	19	1.00	21
Ireland	0.20	2	0.06	3	0.32	8
Italy	1.00	21	0.75	20	0.87	20
Japan	0.58	12	1.00	21	0.61	15
Netherlands	0.49	7	0.08	4	0.15	4
New Zealand	0.43	5	0.00	2	0.13	3
Norway	0.97	19	0.34	9	0.60	14
Portugal	0.70	15	0.39	12	0.65	17
Spain	0.64	13	0.42	15	0.58	13
Sweden	0.49	6	0.43	16	0.37	9
Switzerland	0.76	16	0.40	13	0.01	2
United Kingdom	0.00	1	0.00	1	0.16	5
United States	0.28	4	0.09	6	0.62	16
Average	0.58		0.36		0.44	

Notes: A higher number indicates a greater degree of regulation and all indices are scaled from 0 to 1. The original indices were, therefore, reversed (when necessary) and rescaled. The data come from *Nicoletti et.al* (1999), *Pryor (2002)* and *Kaufman et.al* (1999).

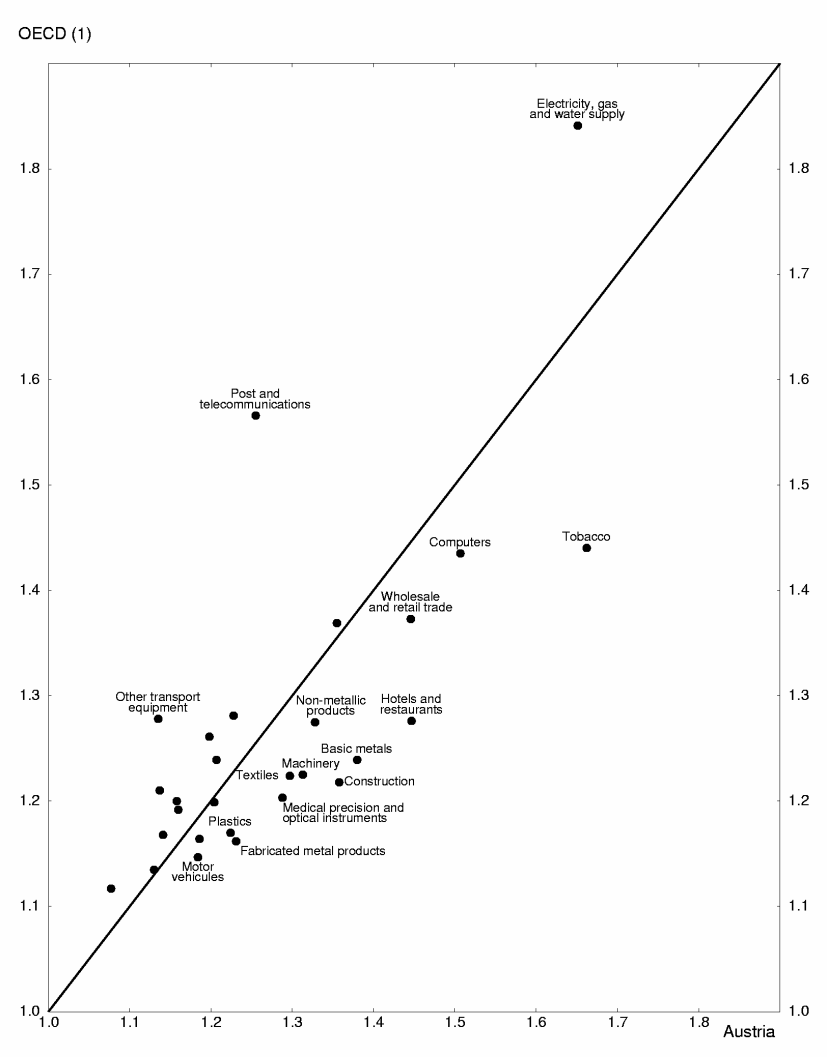
Source: Nicoletti and Pryor (2001).

Selected Eurostat structural indicators also confirm this story of successful deregulation in network industries. This is especially valid for Austrian energy and telecommunication markets where prices have decreased substantially since the mid 1990s – although one has to take into consideration that the starting price levels were amongst the highest in Europe-.

Together with the United Kingdom, Italy, Spain, The Netherlands and Germany, Austria is one of only six EU countries where both electricity (in Austria since October 1st, 2001) and gas (in Austria since October 1st, 2002) markets are already fully liberalised (*E-Control*, 2003) – long before the final deadline (July 1st, 2007) set by the European Commission. Despite a strong increase of market concentration in the electricity markets in Austria (Table 3.2) mainly due to the merger of five regional suppliers to a market dominating enterprise (Energie Allianz),

prices of electricity have developed more in favour of both private and industrial end users than in many other EU countries.

Figure 3.5: Industry–level mark-ups in Austria compared to OECD average (From 1981 to the latest available year)



1. Average of Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Netherlands, United Kingdom and United States.
Source: OECD, STAN database. OECD estimates based on the Roeger method.

Against common expectations, increasing market concentration has not yet (at least not until the year 2003) resulted in rising electricity prices for households (Table 3.3) and industrial users (Table 3.4). In addition, prices for natural gas in Austria have increased very moderately compared to other EU countries and are now roughly in line with the EU average (Table 3.5 and 3.6).

Recent mergers in the energy sector – the so-called Austrian gas and electricity solutions that were heavily promoted by Austrian politics despite serious objections from competition economists (cf. *Böheim*, 2003) – may, however, put the economic benefits from the liberalisation of energy markets seriously at risk. This is the case because of the creation of quasi-monopolistic market structures on the national level. Some recent warnings issued by

the energy regulator concerning impending price hikes of selected suppliers seem to confirm these objections (cf. *Haumer*, 2004).

Table 3.2: Market share of the largest generator in the electricity market, %

	1999	2000	2001	2001 Index [1])
Belgium	92.30	91.10	92.60	100.3
Denmark	40.00	36.00	39.00	97.5
Germany	28.10	34.00	32.00	113.9
Greece	98.00	97.00	98.00	100.0
Spain	51.80	42.40	43.80	84.6
France	93.80	90.20	90.00	95.9
Ireland	97.00	97.00	96.60	99.6
Italy	71.10	46.70	45.00	63.3
Austria	21.40	32.60	34.40	160.7
Portugal	57.80	58.50	61.50	106.4
Finland	26.00	23.30	23.00	88.5
Sweden	52.80	49.50	48.50	91.9
UK	21.00	20.60	22.90	109.0
EU	57.78	55.30	55.95	96.8

1) 1999=100.

Source: Eurostat, WIFO calculations.

Table 3.3: Electricity prices - households (w/o taxes), €

	1996	1997	1998	1999	2000	2001	2002	2003	2003 Index [1])
Greece	0.0609	0.0619	0.0627	0.0622	0.0564	0.0564	0.0580	0.0606	99.5
Finland	0.0770	0.0727	0.0706	0.0656	0.0645	0.0637	0.0697	0.0738	95.8
Sweden	0.0675	0.0675	0.0673	0.0653	0.0637	0.0629	0.0701	0.0838	124.1
Spain	0.1092	0.1050	0.0946	0.0929	0.0895	0.0859	0.0859	0.0872	79.9
France	0.1022	0.1005	0.0962	0.0949	0.0928	0.0914	0.0923	0.0890	87.1
Austria	0.1032	0.0984	0.0969	0.0979	0.0949	0.0945	0.0932	0.0926	89.7
Denmark	0.0646	0.0639	0.0673	0.0681	0.0718	0.0781	0.0865	0.0947	146.6
UK	0.0876	0.0971	0.1039	0.0966	0.1056	0.0996	0.1031	0.0959	109.5
Netherlands	0.0869	0.0877	0.0868	0.0884	0.0938	0.0978	0.0923	0.0970	111.6
Ireland	0.0717	0.0816	0.0795	0.0795	0.0795	0.0795	0.0883	0.1006	140.3
EU (15 countries)	**0.1100**	**0.1081**	**0.1073**	**0.1050**	**0.1031**	**0.1027**	**0.1033**	**0.1034**	**94.0**
Belgium	0.1237	0.1191	0.1186	0.1182	0.1171	0.1184	0.1137	0.1120	90.5
Luxembourg	0.1090	0.1071	0.1060	0.1076	0.1056	0.1120	0.1148	0.1191	109.3
Portugal	0.1259	0.1278	0.1250	0.1201	0.1194	0.1200	0.1223	0.1257	99.8
Germany	0.1320	0.1270	0.1256	0.1277	0.1191	0.1220	0.1261	0.1267	96.0
Italy	0.1508	0.1671	0.1682	0.1570	0.1500	0.1567	0.1390	0.1449	96.1

[1]) 1996=100.
This indicator presents electricity prices charged to final domestic consumers, which are defined as follows: annual consumption of 3 500 kWh of which 1 300 kWh is overnight (standard dwelling of 90m²). Prices are given in Euro (without taxes) per kWh corresponding to prices applicable on 1 January each year.

Source: Eurostat, WIFO calculations

Table 3.4: Electricity prices - industrial users, €

	1996	1997	1998	1999	2000	2001	2002	2003	2003 Index [1])
Netherlands	0.0608	0.0570	0.0566	0.0576	0.0669	0.0640	:	:	:
Austria	0.0814	0.0765	0.0755	0.0763	:	:	:	:	:
Spain	0.0756	0.0703	0.0620	0.0624	0.0636	0.0550	0.0520	0.0528	69.8
France	0.0650	0.0635	0.0596	0.0583	0.0567	0.0557	0.0562	0.0529	81.4
UK	0.0544	0.0604	0.0627	0.0619	0.0664	0.0661	0.0614	0.0539	99.1
Finland	0.0481	0.0414	0.0401	0.0389	0.0377	0.0372	0.0401	0.0566	117.7
Greece	0.0571	0.0580	0.0588	0.0583	0.0571	0.0571	0.0590	0.0614	107.5
EU (15 countries)	**0.0689**	**0.0679**	**0.0663**	**0.0636**	**0.0625**	**0.0644**	**0.0620**	**0.0647**	**93.9**
Sweden	0.0413	0.0430	0.0392	0.0348	0.0375	0.0313	0.0310	0.0666	161.3
Portugal	0.0756	0.0749	0.0712	0.0646	0.0643	0.0651	0.0665	0.0673	89.0
Luxembourg	0.0747	0.0737	0.0725	0.0736	0.0709	0.0632	0.0645	0.0675	90.4
Denmark	0.0473	0.0467	0.0512	0.0485	0.0504	0.0558	0.0639	0.0697	147.4
Germany	0.0906	0.0845	0.0830	0.0791	0.0675	0.0669	0.0685	0.0697	76.9
Ireland	0.0615	0.0691	0.0662	0.0662	0.0662	0.0662	0.0836	0.0762	123.9
Belgium	0.0775	0.0746	0.0746	0.0739	0.0734	0.0752	0.0760	0.0764	98.6
Italy	0.0638	0.0713	0.0721	0.0646	0.0693	0.0919	0.0776	0.0826	129.5

[1]) 1996=100.
This indicator presents electricity prices charged to final industrial consumers, which are defined as follows: annual consumption of 2 000 MWh, maximum demand of 500 kW and annual load of 4 000 hours. Prices are given in Euro (without taxes) per kWh corresponding to prices applicable on 1 January each year.

Source: Eurostat, WIFO calculations

Table 3.5: Gas prices - households, €

	1996	1997	1998	1999	2000	2001	2002	2003	2003 Index [1])
UK	5.52	6.32	6.75	5.98	6.65	6.27	6.63	6.56	118.8
Luxembourg	5.62	5.75	5.76	5.29	5.68	7.63	6.64	6.91	123.0
Ireland	6.97	7.64	7.23	7.35	7.28	7.28	7.27	7.27	104.3
Netherlands	5.82	6.23	6.16	5.72	5.62	6.31	7.03	8.17	140.4
Denmark	:	:	:	6.01	8.95	10.96	7.53	8.33	:
EU (15 countries)	**6.64**	**7.22**	**7.34**	**6.81**	**7.24**	**8.49**	**8.42**	**8.37**	**126.1**
Belgium	6.86	6.92	7.03	6.46	7.44	9.45	8.34	8.58	125.1
Austria	8.61	8.33	7.72	7.80	7.80	8.78	8.78	8.85	102.8
Germany	6.85	7.11	7.00	6.64	6.93	9.65	9.24	8.93	130.4
France	7.27	7.23	7.67	7.36	6.99	8.44	9.19	9.06	124.6
Sweden	:	7.21	7.24	6.79	7.63	9.13	9.63	9.85	:
Italy	7.80	9.00	8.84	8.05	8.79	11.07	9.95	9.86	126.4
Spain	9.28	9.16	9.10	8.85	9.15	11.06	10.46	10.43	112.4
Portugal	:	:	:	:	:	13.68	13.19	12.70	:
Finland	5.01	5.48	7.12	6.58	:	:	:	:	:

[1]) 1996=100

This indicator presents the natural gas prices charged to final domestic consumers, which is defined as follows: annual consumption of 83.7 GJ (equipment: cooking, water heating and central heating). Prices are given in Euro (without taxes) per GJ corresponding to prices applicable on 1st January each year.

Source: Eurostat, WIFO calculations

Table 3.6: Gas prices - industrial users, €

	1996	1997	1998	1999	2000	2001	2002	2003	2003 Index [1])
Spain	3.14	3.73	3.67	2.84	4.05	5.54	4.34	4.81	153.2
UK	2.60	2.89	3.18	3.15	3.53	4.01	5.42	4.87	187.3
Ireland	2.93	3.83	2.96	3.09	3.59	4.65	4.88	4.94	168.6
Denmark	3.42	4.03	3.59	2.65	4.59	5.99	4.49	5.26	153.8
Italy	3.58	4.42	4.23	3.48	4.14	6.58	5.87	5.38	150.3
Belgium	3.97	4.16	4.25	3.46	4.42	6.32	5.25	5.42	136.5
France	3.39	3.58	3.70	3.39	4.29	5.94	4.93	5.46	161.1
Austria	4.84	4.59	4.23	4.23	3.53	5.53	5.62	5.46	112.8
EU (15 countries)	**3.60**	**4.03**	**4.03**	**3.49**	**4.22**	**6.12**	**5.75**	**5.56**	**154.4**
Luxembourg	4.86	5.01	5.03	4.69	4.94	6.89	5.90	6.17	127.0
Finland	3.15	3.98	3.62	2.51	4.53	7.08	6.18	6.37	202.2
Portugal	:	:	:	:	:	6.88	6.26	6.39	:
Germany	4.41	4.96	4.98	4.21	4.78	7.76	7.28	6.73	152.6
Sweden	:	4.86	4.59	3.37	5.07	9.53	5.93	6.80	:
Netherlands	3.38	3.72	3.72	3.09	4.06	5.40	:	:	:

[1]) 1996=100.

This indicator presents the natural gas prices charged to final industrial consumers, which are defined as follows: annual consumption of 41 860 GJ, and load factor of 200 days (1 600 hours). Prices are given in Euro (without taxes) per GJ corresponding to prices applicable on 1 January each year.

Source: Eurostat, WIFO calculations

Because of the strong vertical integration of public utility firms market concentration will remain a substantial problem in the Austrian energy markets at least until (legal) 'unbundling', i.e. until the separation between ownership of network infrastructure and sales of electricity and gas will finally be realised. Another pending problem in Austrian energy markets is horizontal concentration, i.e. public utility firms dominating the entire market by controlling both main sources of energy (electricity and gas), thereby restricting substitution possibilities for end users.

The deregulation in the telecommunication sector is expected to lead to a better diffusion of ICT through lower access prices to telecom services and thus higher overall economic growth (Cf. *Leo*, 2001). The deregulation experience in Austria can be drawn as a diverse picture, but in general it can be considered a success. Through intensive promotion of service competition in fixed-line telecommunication, Austria has managed to decrease telecommunication costs – measured by a combined indicator for both local and long distance fixed-line calls – from the highest level of all EU countries in the mid-1990s by more than 70 percent (Table 3.7). This substantial price decrease is only due to lower rates for long-distance calls. In Austria, rates for fixed-line local calls remain the highest of all EU countries. Due to strong competition from alternative telecom providers, however, market share of the incumbent Telekom Austria is in the meantime the second lowest in Europe – just a fraction higher than Telekom in Finland (Table 3.8).

Table 3.7: Fixed-line Telecommunication - Prices[1]), €

	1997	2003	2003 Index [2]
Sweden	1.10	0.60	54.5
Luxembourg	0.74	0.62	83.8
Denmark	1.43	0.74	51.7
Netherlands	1.29	0.82	63.6
Greece	3.90	1.08	27.7
Finland	1.05	1.11	105.7
Belgium	2.70	1.12	41.5
Spain	3.43	1.16	33.8
Austria	4.36	1.23	28.2
Portugal	3.50	1.27	36.3
Ireland	3.35	1.33	39.7
France	2.60	1.35	51.9
EU	**2.74**	**1.39**	**50.7**
Italy	2.57	1.47	57.2
Germany	3.31	1.64	49.5
UK	2.11	1.69	80.1

[1]) 10 Minutes local + 10 minutes national (long distance) call
[2]) 1997=100

Source: Eurostat, WIFO calculations

Table 3.8: Fixed-line Telecommunication - Market share of market leader, %

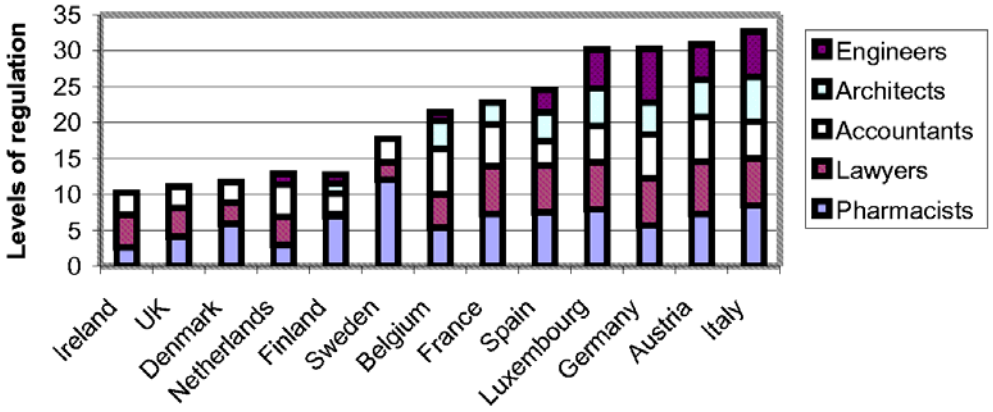
	2001	2002	2002 Index [1]
Finland	32.0	44.6	139.4
Austria	50.0	45.0	90.0
UK	48.0	51.9	108.1
Sweden	69.0	58.0	84.1
France	62.0	59.6	96.1
Ireland	59.0	59.6	101.0
Germany	64.0	60.0	93.8
Denmark	74.0	67.4	91.1
Italy	73.0	69.2	94.8
EU	71.3	69.6	**97.6**
Netherlands	76.0	75.0	98.7
Luxembourg	88.6	80.0	90.3
Spain	84.0	80.2	95.5
Belgium	84.5	81.3	96.2
Portugal	90.0	90.9	101.0
Greece	99.0	95.0	96.0

[1]) 2001=100

Source: Eurostat, WIFO calculations

A completely different picture emerges in the professional service sector – especially in the field of liberal professions. Price fixing, recommended prices, advertising regulations, entry requirements and reserved rights as well as regulations governing business structure and multi-disciplinary practices are the most common restrictions to competition. A comparative study identified these kinds of anticompetitive regulations and practices as a more or less EU-wide phenomenon (*European Commission*, 2004). Nevertheless, this problem seems to be especially severe in Austria compared to other EU member states, since Austria placed second in an EU ranking of the most highly regulated countries in liberal professions (Figure 6).

Figure 3.6: Index of level of regulation in EU Member States



Note: Greece and Portugal are not included becauseof a lack of data on certain professions.

Source: European Commission (2004)..

In summary, we can conclude that there is clear evidence for an invigoration of product market competition in Austria during the 1990s through closer international integration. The comparatively sharp rise in import penetration since the 1990s has probably been spurred by the preparation for the EEA (from 1993) and subsequent full EU membership (from 1995), which imposed comprehensive competition-oriented structural reforms. In order to preserve the favourable growth record of the 1990s, which recently showed signs of fading already, additional competition-enhancing policy measures seem to be advisable (*OECD*, 2003c).

3.4. Conclusions: Towards a growth-oriented competition policy

The core value of competition policy is the protection of free market competition. Thus, competition policy must leave as little room for anti-competitive practices as possible. If anti-competitive behaviour is sanctioned and therefore unattractive, competition intensity is kept high and firms are forced to find other strategies to earn higher profits, i.e. firms have to innovate. By continuously forcing firms to innovate, competition is inducing a permanent "search and discovery process" (*von Hayek*, 1968) resulting in better overall economic performance and growth.

Since empirical evidence on the relationship between competition and growth is not unambiguous, there is no simple general formula for competition policy makers to follow.

What, however, can be concluded from theoretical and empirical research is the existence of a "virtual" optimum of competition intensity that maximises efficiency, innovation and growth. This "inverted U-shaped" relationship demands different policy measures depending on which side of the optimum a market lies. For markets with competition intensities below the optimum ("left-hand side"), more competition would induce positive effects on growth. For markets beyond the optimum ("right-hand side"), the exact opposite would be the case.

The competition intensity optimum will vary with industries and over time. The identification of the competition intensity optimum is a more or less difficult empirical problem, depending on the data available. International comparison of competition intensity in the same industries may therefore serve as a valuable benchmark in assessing the competitive environment of a market.

Empirical research, however, has found that the competition intensity optimum can be found at comparably high levels of competition intensity. According to *Aghion et al.* (2002), innovative activities measured as patents weighted by the number of citations reached their maximum in UK manufacturing industries with competition intensities not far below perfect competition.

This section concludes with some basic recommendations of particular relevance to Austria that can be drawn from theoretical research and empirical evidence (cf. *Böheim*, 2002, *Seong* 2002, *Tichy*, 2000).

First, competition policy should not be not aimed at perfect competition per se. Depending on the industry characteristics (technology, economies of scale and scope and entry barriers), some markets develop better if oligopolistic market structures are tolerated. Since "fine tuning" of oligopoly is a very difficult task – if not impossible at all – competition policy should generally steer away from it. If, however, oligopolistic market structures are indicated, both theoretical research and empirical evidence are clearly in favour of "wide oligopolies", i.e. markets with more than five independent competitors with relevant market share.

Second, competition policy should concentrate on cases where monopoly positions have been achieved and maintained through excluding (potential) competitors restraining trade, or other anticompetitive measures. Market power that has been attained and is maintained through skill, foresight, and diligence without performing anticompetitive measures does not present an intervention scenario for competition policy.

Third, relatively dispersed markets are not the main target of competition policy enforcement. Competition policy tends to be applied in highly concentrated markets. Thus, the focus of competition policy should be on "quasi-monopoly" and "narrow oligopoly", i.e. markets with fewer than five independent competitors with relevant market share. Both game theory (*Selten*, 1973) and empirical research (*Bresnahan and Reiss*, 1991) proved that these market structures foster collusive and anticompetitive behaviour. Thus, in highly concentrated markets, the importance of antitrust policy does not only receive substantial socioeconomic favours, but also strong theoretical and empirical support.

Fourth, empirical research showed that negative effects of competition on innovation and growth only materialise at very high competition intensity levels. Consequently, the field of activity for growth-supporting (growth-destructing) competition policy measures seems to be rather wide (narrow).

Fifth, competition policy has to take a dynamic approach balancing both short-term and long-term effects. Thus, it is not a trivial problem of competition policy makers to cope with the situation when higher competition *ex ante* could lead to more concentration *ex post*.

4. Entrepreneurship, Corporate start-ups and Growth

MICHAEL PENEDER

4.1. Introduction

In the study of the major determinants of economic development, entrepreneurship has been correctly characterised as one of the most intriguing, but equally elusive concepts (*Baumol,* 1993). Part of the difficulty in pinning down the precise meaning of entrepreneurship stems from the sheer weight of the economic functions it is held responsible for. If we dare a bold synthesis of the literature, it is responsible for no less than moving the economic system closer to the equilibrium while simultaneously driving the system away from it. Depending on which intellectual tradition we follow, entrepreneurship either enhances the allocative efficiency of given ends and means, or it drives the dynamic performance of the system through the progressive creation of new products and processes.

Establishing a novel business on the market is one of the purest examples of entrepreneurship, which can contribute to an economy's overall growth and development through at least three distinct mechanisms. First, start-up companies might bid down prices, thus limiting the leeway for anticompetitive behaviour. Consequently, lower prices induce additional demand and raise the level of output. Second, corporate start-ups put new combinations of resources and ideas the test on the market. More entry implies more experimentation and raises the probability of particularly successful combinations. As they discover and develop new market niches, start-ups contribute to greater diversity and quality of products and services, which again helps to keep demand and output growing. Third, entry and exit foster the continuous regeneration of an economy's technological, managerial and entrepreneurial resources, thereby enhancing the adaptation of local production structures to continuous changes in technology and demand.

The final mechanism of structural adaptation refers to long-term processes that are not covered by any empirical data available for this study. What we attempt, however, is to detect general statistical associations that shed new light on the relative importance of the former two mechanisms. Evidently, it is not possible to do so by means of any single country description. The aim of this study clearly necessitates the use of comparable international data. Although these are extremely rare, the use of a new and pioneering database provided by the OECD firm-level study allows us to venture into this largely uncharted territory of empirical research. Unfortunately, Austria is not included in the OECD firm-level study. For this reason, the research plan and presentation deviate from those in other chapters. However, due to the use of an indirect taxonomic approach (which will be explained later), we can at least integrate Austrian data on value added, employment, or gross operating profits into the final regressions on the nexus of entrepreneurship with growth and profitability.

This chapter is organised as follows: First, we screen existing theories of entrepreneurship and entry. Second, we investigate the empirical regularities of firm turnover, net entry, profitability

and growth in an international sectoral dataset. Finally, we try to identify the most promising targets for entrepreneurship policy.

4.2. Theories of entrepreneurship

Although entrepreneurial activity is as old as the first engagement of humankind in some form of economic exchange, it remains difficult to define what precisely accounts for the entrepreneurial nature of entrepreneurs. Screening the literature, we find many attempts for a general definition, but no definite concept. To better understand the variety of ideas, we must therefore lay open some of its major intellectual roots.

In the early 18th century, Richard Cantillon (c. 1680-1734) and the French physiocrats coined the term 'entreprendre', which indicated the general undertaking of a business, but already included ideas. These ideas included the profit motive for engaging in exchange, entrepreneurs facing uncertainty of the 'unknowable' kind, or profits from cost reductions due to the application of new production techniques. Carl Menger (1840-1921), founder of the Austrian school of economics, still used the term "Unternehmertätigkeit" in the traditional sense of a general undertaking of business. However, he particularly recognised the importance of uncertainty that arises because of continuously changing market conditions. Under these premises, he put emphasis on the task of processing information, which proved to be a fruitful ground for further developments by Mises and Hayek. Kirzner defines the modern Neo-Austrian synthesis of entrepreneurial competition, stressing the entrepreneurial *alertness* for hitherto unexploited profit opportunities. Opportunities arise through ignorance (i.e. earlier entrepreneurial errors) and "the continual change in tastes, resource availabilities, and known technological possibilities" (*Kirzner*, 1997, p. 72). The entrepreneurial response can be either arbitrage in pure trading relationships or the adjustment of production to changes in input prices and/or technology (ibid., p. 70). However, opportunities are already given and wait to be discovered. To summarise: "Entrepreneurial discovery is seen as gradually but systematically pushing back the boundaries of sheer ignorance, in this way increasing mutual awareness among market participants and thus, in turn, driving prices, output and input quantities and qualities, toward the values consistent with equilibrium" (ibid., p. 62).

The intellectual seedbed of Carl Menger and the Austrian school produced another concept of entrepreneurship. According to Streissler (1988, p. 163), Friedrich von Wieser was the first to introduce the notion of the creative entrepreneur, whose "heroic intervention of individual man" brings about economic development. Wieser influenced Joseph Schumpeter (1911), who stressed innovation and "creative response" as the defining characteristics of entrepreneurship. For Schumpeter, it is the particular economic function responsible for introducing novelty to the system and thus driving economic change from within.[13] Schumpeter consequently separates entrepreneurship from other economic functions, which may or may not be fulfilled by the same individual, e.g. the capitalist function (characterised by the 'ownership of means'); management (the 'administration of a going concern'), or the

[13] "Seen in this light, the entrepreneur and his function are not difficult to conceptualize: the defining characteristic is simply the doing of new things or the doing of things that are already being done in a new way (innovation)" (Schumpeter, 1947, p. 151).

invention (i.e. producing new ideas, while entrepreneurship means to get things done). The particular earnings that accrue to the entrepreneurial function are the rents attributable to the (temporary) monopoly position established through successful innovation.

A different aspect was put forward by Frank Knight (1921/1957), who distinctly characterised entrepreneurs as people specialising in risk-bearing because they feel confident about their decision-making ability under conditions of fundamental uncertainty. Fundamental uncertainty means the "typical uninsurable (because unmeasurable and this because unclassifiable) business risk" that "relates to the exercise of judgement in the making of decisions by the business man" (ibid., p. 60). Among others, people differ in their "intellectual capacity to decide what should be done" as well as their "confidence in their judgement and powers and in disposition to act on their opinions" (ibid., 63). The defining characteristic of a new start-up organisation is therefore the division of labour "under which the confident and venturesome 'assume the risk' or 'insure' the doubtful and timid by guaranteeing to the latter a specified income in return for an assignment of the actual results" (p. 63). Knight tries to explain the division of labour within the firm organisation and thus relates naturally to the question of occupational choice. Entrepreneurs are those who run a business. However, Knight does not identify any specific entrepreneurial function that would be independent of the two. This explains his limited influence on contemporary economic theories of entrepreneurship. Only a few examples directly apply Knight's concept.[14]

One can find many alternative definitions in the literature. Most of them bear resemblance to the concepts of Knight, Kirzner, or Schumpeter. Although each of them adds some specific and meaningful insights, they typically lack either the conceptual clarity or the comprehensiveness of the former approaches. For instance, Leibenstein (1968) points at the frequently incomplete knowledge about parts of the production function and argues that entrepreneurs "must in some way make up the deficiency" by the means of "gap-filling" and "input-completing" (ibid., p. 73f). Besides the connecting of different markets, he explicitly adds the foundation and setting up of a new firm to the list of defining characteristics of Schumpeterian entrepreneurship.

Similar to Leibenstein, Theodore Schultz (1975) highlights the function of enhancing efficiency through moves towards the current frontier of technology in production. The latter, however, is continuously upset by exogenous technological changes, for example from publicly funded R&D or innovations produced in other sectors of the economy. He therefore emphasises 'imitative' entrepreneurship, which is characterised by the adoption of exogenously changing technologies and, in principle, can be subsumed under the Neo-Austrian notion of the discovery process – even though the latter is less explicit about it. Schultz, who pioneered human capital theory, postulates the 'ability to deal with disequilibria' as the distinguishing personal characteristic of entrepreneurs. Arguing that this ability can be enhanced by

[14] One is Kihlstrom and Laffont (1979), who present a general equilibrium model of firm formation based on the occupational choice of people with less risk aversion to run their own business and the others to become employees. Another example is Evans and Jovanovic (1989), who empirically test a model of occupational choice, demonstrating that imperfections in the capital market impose liquidity constraints on would-be entrepreneurs. Their finding demonstrates that entrepreneurs must use their own funds for a considerable part of their ventures and thus must bear the risks associated with the capitalist function as well.

education and experience, he also invokes an important responsibility for educational policies.[15]

William Baumol proposed that Schumpeter's enumeration of entrepreneurial new combinations "can usefully be expanded to include such items as innovations in rent-seeking procedures, for example, discovery of a previously unused legal gambit that is effective in diverting rents to those who are first in exploiting it" (*Baumol*, 1990, p. 897). He thereby defines entrepreneurs "simply, to be persons who are ingenious and creative in finding ways that add to their own wealth, power, and prestige" (ibid.). Economic policy is thus responsible for defining 'the rules of the game' such that opportunity-seeking abilities are channelled into productive value-creating as opposed to mere rent-shifting activities. In principle, there is not much to object to in this definition. Schumpeter never claimed that entrepreneurs always act to the benefit of society, and rent shifting is certainly present in the popular notion of 'creative destruction'. The problem is that Baumol extends the definition of entrepreneurship to include all kinds of opportunity-seeking behaviour – in his own words encompassing, for instance, political rent seeking and 'organised crime'. However, this appears to be an unnecessary burden for a general definition of entrepreneurship. Furthermore, Baumol's concern for productive versus unproductive activities does not the least depend on it. In order to regain some clarity of concepts, we should therefore keep entrepreneurship separate from political and other instances of opportunity-seeking behaviour. The former is then restricted to the context of competitive markets, which of course produces rent-shifting activities, such as displacement effects from gaining market share at the cost of other firms as an inevitable by-product of the dynamic market process.

At this stage, we must address two delicate questions concerning the precise locus of entrepreneurship. The first question regards the permanence of behavioural characteristics. Schumpeter and others, who apply his narrower definition of innovative entrepreneurship, have argued that as entrepreneurial success leads to the building and subsequent expansion of organisations, the entrepreneurial resources of the founder are likely to become absorbed by management responsibilities in the later stages of its development. According to this view, entrepreneurship cannot be an occupational category, but is restricted to those who establish 'new combinations' – with the start-up of a novel business generally considered to be among its purest manifestations. Consequently, empirical studies of entrepreneurship are concerned with start-ups and new venture creation. A different concept appears in the models of occupational choice, which treat all the self-employed (or employers, more narrowly) as entrepreneurs. Entrepreneurship thus corresponds to the broader functions of

[15] Three examples highlight the impact of Schultz on contemporary models of entrepreneurship. Schmitz (1989) as well as Holmes and Schmitz (1990) build strongly on the notion of 'imitative' entrepreneurship, assuming exogenous opportunities which continuously arise in the form of disequilibria. In the model of Schmitz (1989), spillovers in the accumulation of knowledge cause economies to grow faster with a higher proportion of imitating entrepreneurs who implement the current techniques. In the model of Holmes and Schmitz (1990), people with greater entrepreneurial abilities specialise in the development of new products, e.g. by starting a new business, but can transfer that business to another person at later stages. Finally, Lazear (2002) develops an intriguingly simple model of occupational choice, in which he distinctly characterises entrepreneurs as 'jacks-of-all-trades', who do not excel in any single skill, but are competent in many.

general opportunity recognition (and risk bearing), but as an empirical entity it is restricted to people who run an independent business.

This leads to the second question, which regards the role of entrepreneurship within the many large corporations that are not run by an independent founder, owner, and manager. All of these corporations must be entrepreneurial in the broad sense of pursuing and exploiting profit opportunities within the context of competitive markets. However, even if we apply the Schumpeterian definition, many of them actively engage in innovation and new venture creation. But where is the locus of the entrepreneurial function in the large corporation? In the simplest and most naive interpretation, shareholders delegate the entrepreneurial function to the top-level executives (labelled 'intrapreneurs'), in the same way as they do with the functions of general management. Sophisticated studies of internal venture creation, however, draw a more complex picture. *Burgelman* (1983a,b) pioneered the concept of *corporate entrepreneurship*, regarding an existing firm's diversification strategy to enter a new market as the corporate analogue to the process of individual entrepreneurship in the case of founding a new company.[16] Stripped down to the most essential, in this model the entrepreneurial function arises from the organisational context, where innovative firms are expected to differ in the way they define the structural context of *internal experimentation* and *selection*.

All the above concepts of entrepreneurship originate from specific academic fields such as economic development, industrial economics, human capital theory, or business strategy. In recent decades, however, entrepreneurship research has also emerged as an independent branch of scientific inquiry, multidisciplinary but mostly associated with the management focus of business schools. How do its leading representatives define entrepreneurship? *Shane and Venkataraman* (2000, p. 217) critically observe that "entrepreneurship has become a broad label under which a hodgepodge of research is housed." Among the many definitions in the literature, the one aspect that prevailed most is its opportunity-seeking nature, which is also the common denominator in the concepts of Kirzner and Schumpeter. For example, we find this in the widely used textbook of *Sahlman* et al. (1999, p. 10), who define their management approach to entrepreneurship as "the pursuit of opportunity without regard to resources currently controlled". While many authors remain vague about the precise economic function they have in mind, they generally tend to lay more emphasis upon the Schumpeterian idea of innovative entrepreneurship. Notable examples are *Venkataraman* (1997) or *Shane and Eckhardt* (2003). The latter provides the most memorable formulation, when they "define entrepreneurial opportunities as situations in which new goods, services, raw materials, markets and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships" (ibid. p. 165).

[16] Burgelman distinguishes three constitutive elements: First, the 'structural context' is set-up by top-level executives and aims at keeping strategic initiatives in line with the current concept of corporate strategy. Second, 'induced strategic behaviour' represents those initiatives that fit within the existing categories and correspond to the firm's strategic planning. Finally, he postulates the existence of 'autonomous strategic behaviour', which is largely outside the firm's current context of strategy. It typically emerges at lower levels of the management hierarchy, where it is a high-risk and high-reward personal strategy for advancement into the upper ranks. Nevertheless, the outcome ultimately depends on the acceptance of the top-level management to modify its structural context of strategy selection.

A different tradition is exemplified by Marc Casson (1982), who attempts a comprehensive synthesis that does not subscribe to any particular one of the research traditions presented above. In a sense, he mostly echoes Frank Knight's concept of fundamental uncertainty when defining the entrepreneur as "someone who specialises in taking judgemental decisions about the coordination of scarce resources" (ibid., p. 23), further explaining that judgemental decisions are those for which no "obviously correct procedure" exists in the sense of the "routine application of a standard rule" (*Casson*, 2003, p. 225). *Hébert - Link* (1989) or *Wennekers - Thurik* (1999) follow a similar vein.[17] However, any such synthetic definition comes at considerable cost. For analytical purposes, we critically miss, for instance, the distinction between equilibrating and disequilibrating functions that lies at the heart of most economists' concern about entrepreneurship. In short, while a purely behavioural definition can be stated in simpler terms, the emphasis on particular economic functions would require additional differentiation.

Where do all these varying concepts and definition leave us with regard to the theory of entrepreneurship? If we want to escape the taunted elusiveness of its core notion, we must attempt a *modular* synthesis, which (seemingly paradoxical) tries to integrate the functional, behavioural and occupational dimensions of entrepreneurship by means of explicitly differentiating them. The result is a modular kit helping to understand where the various concepts complement each other or overlap and what implicit assumptions they involve with respect to the other dimensions (Table 4.1).

To begin with, we propose a simple and general behavioural definition: *Entrepreneurship is the pursuit and exploitation of profit opportunities within the context of market competition*. This definition states in general terms what entrepreneurs do and deliberately delimits any kind of 'political' rent-seeking or any other kind of non-market opportunity-seeking behaviour. For understanding how entrepreneurial behaviour contributes to the operations of the overall economic system, it is necessary to further distinguish the two opposing but equally important functions it serves:

- As an *equilibrating force of market co-ordination*, 'Neo-Austrian' entrepreneurship is initiated by the alertness to and discovery of given imbalances, for instance, in the price/quantity relationships (arbitrage and speculation under fundamental uncertainty), or with respect to inefficiencies in production (adoption of state-of-the-art practices and technology).
- As a *disequilibrating force of innovation*, 'Schumpeterian' entrepreneurship is the creative act of establishing novel combinations (with respect to resources, methods and organisation of production, goods and services, industrial organisation, and market access) that transform the existing means-ends framework and thus drive economic development.

[17] See, for instance, *Wennekers - Thurik* (1999, p. 46): "Entrepreneurship is the manifest ability and willingness of individuals, on their own, in teams, within and outside existing organizations to perceive and create new economic opportunities (new products, new production methods, new organizational schemes and new product-market combinations), and to introduce their ideas in the market, in the face of uncertainty and other obstacles, by making decisions on location, form and the use of resources and institutions."

The functional explanations of entrepreneurship pose problems for the identification of appropriate units of analysis in any empirical investigation. The ultimate locus of entrepreneurial behaviour is always the individuals, but the prior discussion has demonstrated the impossibility of matching that with the occupational choice of being self-employed or a salaried employee. Independent of the two functional categories, we must therefore also distinguish between two distinct organisational contexts that define the locus of entrepreneurial behaviour with respect to a person's *occupational choice*.

- The traditional locus of entrepreneurship are independent self-employed persons running their own businesses. This *independent entrepreneur* is always opportunity-seeking in the sense of the broad definition of entrepreneurship, but simultaneously performs the capitalist function of owning and the administrative function of managing that business. Not surprisingly, we find this type most frequently in small and medium-sized enterprises, although no definite restriction by size exists.
- In many (predominantly large) firms, we find a division of labour where the share-holders perform the functions associated with ownership, while the opportunity-seeking and managerial functions of a business are delegated to the top-level executives, business strategists, etc. The locus of the entrepreneurial function is then with salaried employees, or *corporate entrepreneurs*, and depends to a much greater extent on organisational context.

Table 4.1: Definitions of entrepreneurship – a modular synthesis

General behavioural definition:

Entrepreneurship is the pursuit and exploitation of profit opportunities within the context of market competition.

Functional differentiation (equilibrating vs. disequilibrating):

Market coordination:	Alert discovery of given opportunities (arbitrage; adoption of the state of the art).
Innovation:	Establishing novel combinations that transform the existing means-ends framework.

Occupational differentiation (locus of entrepreneurship):

Independent entrepreneurship:	Owner-managers running an independent business (either all self-employed, or employers more narrowly)
Corporate entrepreneurship:	Salaried managers (pursuing opportunities on the market, but within the organisational context of the firm).

Sources: Schumpeter (1911, 1947), Schultz (1975), Kirzner (1997), Burgelman (1983a), Wennekers – Thurik (1999), Shane and Eckhardt (2003), and others.

In short, the proposed modular synthesis presents the functional and occupational differentiations as sub-categories of the general behavioural definition. Whereas only the behavioural definition can claim general validity, both differentiations are essential for performing a focused analysis, linking entrepreneurship to two central economic functions and specifying empirically observable entities. The modular structure is necessary because the distinct categories of neither the functional nor the occupational differentiations would

precisely coincide with according behavioural distinctions of what entrepreneurs do. For the purpose of this paper, we will focus on business start-ups as one of the purest manifestations of entrepreneurship, which simultaneously corresponds to opportunity-seeking behaviour more in general, as well as to the Schumpeterian function of establishing novel combinations in particular.

4.3. Corporate start-ups, growth and profitability

For an empirical test of the nexus between growth and profitability with entrepreneurship, we need to match data on firm entry and turnover with data on price-cost margins, employment and value added. While the OECD STAN data base provides reliable information for a large number of countries on the latter variables on activity and performance, comparable international data on firm entry and turnover are only available for a small subset of countries having participated in the OECD firm-level study. Instead of a direct test of the statistical association between these variables, the lacking match between the data on corporate demography and the data on economic activity/performance necessitates an indirect approach by means of a new sectoral taxonomy that we are going to construct.

Our research plan is the following. First, we argue that opportunity and the cost of experimentation are the prime movers of business start-ups and firm entry, presenting an inductive typology that explains the variables we choose and the way we intend to interpret the results. Second, we apply statistical cluster analysis to identify the empirical taxonomy. Third, we derive tentative hypotheses on the statistical association between an industry's demographic characteristics and its performance in terms of growth and profitability. In the final step, we analyse differences in the performance of the various sector types and check for consistency with our initial hypotheses.

Opportunity and the cost of experimentation

At the most fundamental level, the probability of a start-up business is determined by the individual entrepreneur's assessment of two factors: (i) opportunity and (ii) cost of experimentation. The first determinant refers to expected post entry operating profits π^e, and the second to sunk investment F required to enter the market (*Geroski*, 1995):

$$Z_i = \beta(\pi^e - F) + \varepsilon_i$$

Difficulties arise from the fact that π^e depends on F, since the size and persistence of entry barriers are also the major determinants of profitability in an industry. The sunk cost to enter a market raises incumbents' price setting power, generally allowing them to earn supernormal operating profits π. Such entry barriers may be due to legal restrictions, or reflect sunk investment in physical capital, R&D, marketing, customer relations, or any other corporate assets that raise the entrants' minimum efficient scale of operations. What further complicates the matter is that entry barriers do not need to be exogenous, but can also result from endogenous strategic interactions among incumbent firms, who, for instance, lobby for certain legal privileges or engage in escalating marketing and R&D races. In other words, incumbent firms might excessively raise expenditures on sunk investments in order to increase

the cost of entry (*Sutton*, 1991). Consequently, entry barriers depend on strategic actions to preserve long-run profitability.

From a static viewpoint with perfectly rational and homogenous agents, entry will occur as long as the discounted value of expected returns is higher than the entry cost, i.e. $\pi^e > F$ (Baumol 2002). Since entry depresses the incumbents' price setting power, profits go down as long as entry increases. In equilibrium, expected post entry profits net of entry cost would be zero ($\pi^e - F = 0$) and Z_i only depend on stochastic variations without any systematic component, i.e. neither profits nor entry barriers could explain actual variations of entry ratios. Of course, this does not imply that actual profits are zero. The point is that incumbents deter entry and thus maintain supernormal profits by deflating expectations about post entry returns. As long as the threat to write-off sunk investments in the case of entry and the according aggressive pricing behaviour of incumbent firms is credible, expected post entry profits are lower than the actual profits without entry.

Entry and exit are indeed dominated by idiosyncratic firm-specific factors, which result in large stochastic variations repeatedly found in the data. Nevertheless, the static equilibrium view is at odds with the empirical fact of enormous turbulence among corporate populations (see, e.g., *Haltiwanger*, 2000; *Bartelsmann* et al. 2003). What these international surveys suggest is that to a considerable degree, actors are ignorant about the precise match between opportunities and their own capabilities. Many start-ups simply fail to make an accurate guess about their post entry profits, often failing within a few years after beginning their operations. Furthermore, firms are not homogenous but differ in their competitive strengths and weaknesses, as we see, for instance, when competitive entrants displace incumbent firms that do not meet the elevated market standard. From this alternative perspective, entry and exit are the outcome of continuous *experimentation* among reasonable and reasoning (but not perfectly rational) heterogeneous agents. Both Kirzner and Schumpeter share that understanding of competitive markets as fast-moving environments in which restless and rivalrous entrepreneurs seek their opportunities to make profit.

Loosely speaking, successful entrepreneurs thrive on change, since change is what offers new opportunities for profit. Conceptually, change may arise from two different channels: First, it might be caused endogenously by the Schumpeterian type of creative response to perceived wants and needs. Second, it might stem from exogenous shocks, which induce entry as a transitory adjustment mechanism in the sense of Kirzner's emphasis on entrepreneurial alertness. In contrast to the static equilibrium view, even then adjustment is not instantaneous. Although the market moves towards equilibrium (with zero profits net of entry cost), this process takes time and fast-moving entrepreneurs make an extra profit from being first in discovering new opportunities. In the tradition of Austrian economics, markets are generally assumed to move faster than adjustment takes place. Consequently, the entrepreneurial discovery of opportunities for profits (net of entry cost) is no longer a mere transitory effect, but constitutes the essential characteristic of the competitive process in both research traditions.

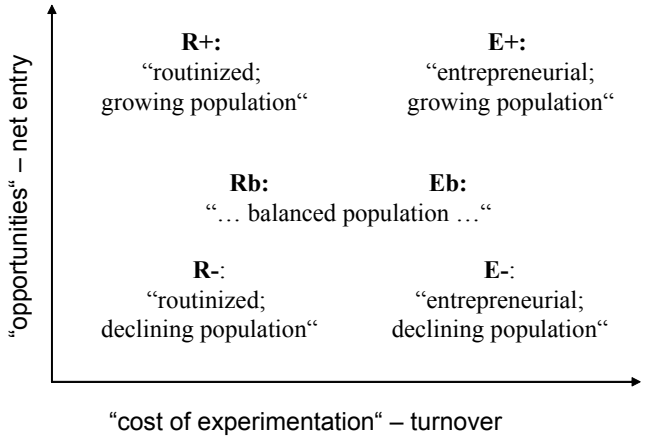
Despite this common ground, the two perspectives are largely divergent in their implications for economic growth. Applying Kirzner's rationale, entrepreneurship fosters the adjustment of

production to exogenous changes in technology and demand. It primarily affects economic welfare through the more efficient allocation of resources, but also fosters economic growth by the means of a more rapid adjustment process. In contrast, Schumpeterian entrepreneurship directly enhances long-term growth and development through its generation of innovations that shape technology and demand instead of merely adapting to it. But Schumpeter provoked much confusion and debate, when in his later writings the locus of innovations shifted from his initial emphasis on the independent owners and creators of a new business (*Schumpeter*, 1911) to the large and specialised research laboratories of big enterprises, where innovation has become a 'routine' task of management which typically involves large capital investments (*Schumpeter*, 1942). The two modes are frequently labeled Schumpeter 'Mark 1' and 'Mark 2' in the Neo-Schumpeterian literature on innovation. *Winter* (1984), *Audretsch* (1991) or *Malerba – Orsenigo* (1993) established the notion of 'entrepreneurial' versus 'routinised' technological regimes to characterise the two modes and made clear that these are best understood as different competitive environments that correspond to characteristic differences between sectors.

If opportunity and the cost of experimentation are those market characteristics that determine the extent of entrepreneurial activity in terms of start-up businesses, we may try to conceptualise a tentative typology of markets and industries based on these two criteria. Our empirical proxy for entrepreneurial opportunity is the net entry ratio, i.e. a year's entry minus exits divided by the total number of firms. A positive (negative) net entry ratio indicates a growing (declining) firm population. Conversely, the turnover rate (i.e. the sum of entry and exits divided by the total firm population) is our proxy for the cost of experimentation. High (low) turnover indicates a high degree of mutability (inertia) in the composition of the firm population.

Figure 1 offers a first interpretation of different combinations between entrepreneurial opportunity and the cost of experimentation. We thereby follow the distinction between "entrepreneurial" and "routinised regimes". Please note, however, that in contrast to the aforementioned literature, we do not define markets or industries in terms of innovative behaviour, but according to demographic characteristics of its firm population. Although this is an important deviation from the initial approaches, the two concepts are closely related. We therefore refrain from inventing new labels for our sectoral classification. Consequently, in our typology 'routinised' markets are defined by a highly inertial population of firms. In other words, when barriers to entry (and exit), i.e. the according cost of experimentation, are high, we also expect an above-average inertia of the firm population. Depending on the rate of net entry, we further distinguish between routinised markets characterised by a growing (R+), balanced (Rb), or declining population (R-). Conversely, we define "entrepreneurial" markets as those with a highly mutable population composition, which again can either experience a growing (E+), balanced (Eb), or declining (E-) number of firms.

Figure 4.1: An inductive typology of routinised vs. entrepreneurial markets

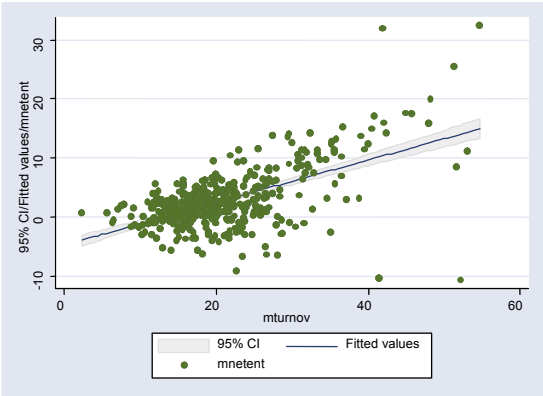


The taxonomy

Figure 4.1 presented an *a priori* compartmentalisation of all possible combinations within that two dimensional area. Confronted with real data, however, not all of the above combinations are equally likely. Figure 4.2 shows a scatterplot including the fitted values of a simple bivariate regression of net entry and turnover rates for 5-year-averages of about 40 (roughly ISIC 2-digit) sectors in 10 countries covered by the OECD firm-level study. This project produced roughly harmonised data on corporate demography for the United States, Germany, France, Italy, United Kingdom, Canada, Denmark, Finland, the Netherlands and Portugal, most of them originating from business registers or social security databases. *Bartelsman* et al. (2003) provide a detailed description.

There are two important features. First, this figure demonstrates the positive general association of net entry and turnover rates with a highly significant correlation coefficient of 0.59. Second, and relatedly, it tells us that the two types, namely entrepreneurial markets with declining firm population (E-) and routinised markets with growing population (R+) are very rare, if they occur at all.

Figure 4.2: Scatterplot of net entry (vertical axis) and turnover (horizontal axis) with fitted values



Note: 5-year averages of the latest available data per country and sector.
Source: OECD and own calculations.

Turning to the empirical identification of the sectoral taxonomy, we apply a multi-stage approach based on k-means clustering with Euclidean distances in the first step of the analysis and hierarchical clustering based on the average linkage method and the city-block dissimilarity measure in the second step. Peneder (2003) offers a detailed explanation of all the necessary choices and procedures involved in that process. The statistical clustering resulted in the classification of each sector per country into one of six mutually exclusive groups that emerged as particularly distinctive categories of our data sample. Consistent with our prior inspection of Figure 4.1, we do not find any observation that can be characterised as a routinised industry with inertial but growing firm population. In addition, entrepreneurial industries with a mutable but declining population are extremely rare. Table 4.2 shows the frequency distribution by sectors. Because of differences in the sectoral coverage between countries, we simultaneously processed certain industries at different levels of disaggregation, as long as the number of available observations per sector was greater than or equal to 3.

Table 4.2: The consensus classification with frequency distribution over individual categories

ISIC Rev.3	Industry name	Initial Clusters E+	Eb	E-	Rb	R-	O	Consensus Classification
Entrepreneurial industries with growing population								
55	Hotels and restaurants	4	3				2	**E+**
72	Computer and related activities	3	1			1	1	**E+**
74	Other business activities	4	1			1	1	**E+**
70-74	Real estate renting and business activities	4	1			1	2	**E+**
Entrepreneurial industries with balanced population								
45	Construction		5	2			2	**Eb**
01-05	Agriculture, hunting, forestry and fishing	2	2	2			2	**Eb**
50-55	Wholesale and retail trade; restaurants and hotels		4				4	**Eb**
50-74	Business sector services		4			1	3	**Eb**
90-93	Other community social and personal services	1	2	1	1		3	**Eb**
Other industries								
24	Chemicals and chemical products	2			1	1	4	**O**
25	Rubber and plastics products					2	6	**O**
26	Other non-metallic mineral products				1	2	7	**O**
28	Fabricated metal products except machinery and equipment					1	6	**O**
29	Machinery and equipment n.e.c.				1	1	6	**O**
30	Office accounting and computing	1		2	2		1	**O**
31	Electrical machinery and apparatus nec				1	2	5	**O**
32	Radio, television and communication equipment				1	3	4	**O**
33	Medical precision and optical instruments		1		2	2	2	**O**
64	Post and telecommunications	3			2	2	1	**O**
66	Insurance and pension funding except compulsory social security			1	1	1	4	**O**
67	Activities related to financial intermediation	1	1			1	3	**O**
70	Real estate activities	2	1			1	3	**O**
71	Renting of machinery and equipment		1			1	2	**O**
73	Research and development	1			1	1		**O**
75	Public administration and defence; compulsory social security	1	1	1	1	2	1	**O**
85	Health and social work	1			2		4	**O**
353	Aircraft and spacecraft	1			1		1	**O**
10-14	Mining and quarrying	1		2	1	2	2	**O**
15-37	Total manufacturing		1		2		7	**O**
21-22	Pulp paper, paper products, printing and publishing		1		1	2	5	**O**
27-33	Basic metals metal products, machinery & equipment, excl. transport				3		5	**O**
27-35	Basic metals metal products machinery and equipment				3		6	**O**
29-33	Machinery and equipment				1	1	6	**O**
30-33	Electrical and optical equipment				1	2	5	**O**
352+359	Railroad equipment and transport	2			1	1	1	**O**
36-37	Manufacturing nec; recycling	2				3	5	**O**
50-52	Wholesale and retail trade; repairs		2			1	6	**O**
60-63	Transport and storage			1	1		5	**O**
60-64	Transport and storage and communication	3			1		4	**O**
65-67	Financial intermediation		1	2	1	3	2	**O**
65-74	Finance, insurance, real estate and business services	1	1	2		1	3	**O**
75-99	Community social and personal services	1				1	5	**O**
Routinized industries with balanced population								
27	Basic metals	2			2	3		**Rb**
34	Motor vehicles, trailers and semi-trailers				4	3		**Rb**
80	Education	1			2	1	3	**Rb**
2423	Pharmaceuticals			1	3	1		**Rb**
23-24	Chemical and fuel products				2	2	3	**Rb**
23-25	Chemical rubber plastics and fuel products				4	1	4	**Rb**
27-28	Basic metals and fabricated metal products		2		3	1	3	**Rb**
34-35	Transport equipment	1			5	2	1	**Rb**
40-41	Electricity gas and water supply	1			3	3	1	**Rb**
Routinized industries with declining population								
20	Wood and products of wood and cork		2			6	2	**R-**
35	Other transport equipment	1		1	1	3	2	**R-**
65	Financial intermediation except insurance and pension funding	1			1	4	1	**R-**
351	Building and repairing of ships and boats				1	5		**R-**
15-16	Food products, beverages and tobacco	1		1	1	5	2	**R-**
17-19	Textiles, textile products, leather and footwear			3		6	1	**R-**
24 ex 2423	Chemicals excluding pharmaceuticals	1				3	2	**R-**

Note: 1) no classification available for ISIC 23 (coke, refined petroleum, and nuclear fuel), 95 (private households with employed persons), and 99 (extra territorial organisations);
2) when frequencies do not sum up to ten, sectors were missing for particular countries.

The common clustering of data from all the countries with available data implies that, depending on the particular country, any sector can be identified as belonging to different categories. Not surprisingly, we find indeed much variation between the nations, as the frequency of observations across the various categories in Table 4.2 demonstrates. For the purpose of a single joint identification in the final classification, we must aggregate the information into one common taxonomy. Due to the nominal nature of the categories, no aggregation by mean values, median, or additional clustering seemed applicable. Fortunately, in most cases, focussing on the frequency distribution produced a marked single peak in one of the six categories. We therefore took this as its final identification. In a few instances, however, identification was not that straightforward and required some reasoned intervention. For example, in ISIC 90 to 93 ("Other community and social services"), the peak of the frequency distribution appears with the large group of other sectors O, whereas the categories E+, Eb, and E- would comprise more cases when taken together. In that instance, we classified this industry as Eb instead of O. Similarly, some sectors had no single peak, but a maximum frequency in 2 or more categories. When the majority of observations were clearly within either of the entrepreneurial or the routinised regimes, we accordingly identified them as Eb or Rb, respectively. In a few cases, where observations were more widely spread across both entrepreneurial and routinised regimes, the final classification was with the residual category of other industries (O). The last column in Table 4.2 presents this final classification, which is made up of the five categories E+, Eb, O, Rb, and R-. The hypothetical categories of E- and R+ were dropped because they did not dominate in any of the sectors.

As a first piece of cluster validation, Table A.1 in Annex A presents the results of an OLS regression of turnover and net entry as dependent and the country- and industry-type effects as independent variables. Interaction effects between sector types and countries hardly produced any significant coefficients and were therefore omitted in the final regression. According to the independent country effects, most countries experienced a higher turnover rate than the USA. The only exceptions with a significant negative coefficient are Italy and the Netherlands in the regression on turnover rates without employment weights. Using employment-weighted firm turnover as dependent variable, the coefficient for Italy becomes positive and the one for the Netherlands insignificant. When looking at net entry (without employment weights), we find significant negative coefficients for the Netherlands and Finland, but significant higher values for Canada, West Germany and Italy. When employment weights are used, the country effects are hardly significant. This is also the reason for the disappointingly low R-squared of 0.12. In all three other regressions, the overall share of explained variation reaches a satisfying 39% to 49%.

Compared to the group of routinised industries with an inertial but declining firm population (R-), turnover is significantly higher in both kinds of entrepreneurial regimes. While the evidence shows that entrepreneurial industries with a growing population (E+) are the most mutable, we only find a significant difference for those with a balanced population (Eb) when using employment-weighted data. The category of other industries does not differ significantly, whereas routinised industries with a balanced population (Rb) show a significantly lower turnover rate than those with a declining population. When measured with employment weights, all other sector types have a significant higher net entry rate than the

comparison group with the E+ category again showing the highest population growth. Except for the group of routinised industries with a balanced population, the same applies when the net entry rate is based only on the number of companies without employment weights.

Table 4.3: Summary table of OLS regression coefficients for the industry types: net entry and turnover of firms

Independent variables	Entrepreneurial		Routinised		Other
	growing (E+)	balanced (Eb)	balanced (Rb)	declining (R-)	
Turnover (comp)	7.49 (5.66)***	2.04 (1.78)*	-3.36 (3.11)***	c.g.	0.26 (0.31)
Turnover (empl)	4.67 (5.90)***	2.49 (3.64)***	-1.37 (2.13)**	c.g.	0.35 (0.68)
Net entry (comp)	5.24 (5.96)***	1.70 (2.24)**	1.36 (1.89)*	c.g.	2.44 (4.29)***
Net entry (empl)	2.13 (4.97)***	0.89 (2.40)**	1.11 (3.16)***	c.g.	0.96 (3.45)***

Note: c.g. = comparison group; the complete regression results are displayed in Table A.1 of Annex A.

The nexus with growth and profitability

We are now prepared to investigate a set of hypotheses on the nexus between growth and profitability with entry and turbulence of a firm population. First, we focus on the sectoral growth rates of value added, employment and labour productivity, which signal entrepreneurial opportunities that relate to market dynamics. Then we will turn to gross operating profits, covering an alternative aspect of entrepreneurial performance. The variables are from the OECDs STAN database, from which we extracted sectoral data for 24 countries (including Austria) from 1992 to 2000.

Of course, both types of performance measures are determined by a number of other factors that are not controlled for in this simple OLS regression analysis. We cannot offer a fully specified sectoral model of profitability or growth, so that questions of the precise causality cannot be settled in our estimations. In addition, we must expect a lot of unexplained variation, which is displayed by the generally low R-squared in the tables. What we more modestly seek for, however, are systematic statistical association between these performance measures and the firm demographic characteristics captured in our new sectoral taxonomy.

To begin with the effects of our distinct sectoral regimes on the growth rates of value added, employment, and labour productivity, we test the following broad *a priori* conjectures:

- $H0_{growth}$ – *Schumpeter Mark 1*: According to the early writings of Schumpeter, starting and owning an independent business is the purest example of innovative entrepreneurship. We therefore expect that entrepreneurial industries with mutable firm populations grow faster than other sectors in terms of output, employment, and labour productivity (at least as far as the latter tends to correlate with output growth).

- $H1_{growth}$ – *Schumpeter Mark 2*: Given that our data covers only developed OECD countries, the historical argument of the late Schumpeter leads us to expect that the routinised industries with an inertial firm population bear most of the innovative activities and therefore grow faster than other sectors in terms of output, employment, and labour productivity.

The results of the estimations are displayed in Table A.2 in Annex A. All the year dummies are significant for the former, demonstrating how exceptionally high the growth of labour productivity and value added was in the period of 1999/2000. For employment, the dummies capture the particularly weak performance in the years 1992 to 1994, but otherwise they are not significant. Apart from a few exceptions, the country effects in terms of value added growth relative to the USA are all significantly negative, while those for employment and labour productivity growth are significant in only a few instances.

If we take a closer look at the position of Austria, we find that only growth of value added (at current prices) differed significantly from the US benchmark. With a coefficient of –0.060, Austrian industries only outperformed Belgium and Germany, for which average growth in value added fell even further behind that of US industries. With respect to sectoral growth rates of employment, Austria on average performs better than eight other countries in that sample (among them, for instance, Germany, the UK, or the Czech Republic). In addition, average growth of labour productivity does not differ significantly in Austria from that of US industries, with its coefficient representing precisely the median of the individual country effects (i.e. we have 11 countries with a higher and 11 countries with a lower coefficient). In short, on average Austrian sectors show no distinctive growth features, except for a significant and below-average growth of value added (at current prices).

For the new sectoral classification, we generally observe a positive association between market dynamics and net entry, although the distinction between entrepreneurial and routinised sectors according to the overall mutability of the firm population clearly matters. Overall, the new taxonomy highlights some unanticipated differences in the dynamic characteristics of this market. For instance, while the group of entrepreneurial industries with a highly mutable and growing population (E+) experienced the highest growth in terms of value added and employment among all the five industry types, it is also the one with the lowest growth of labour productivity, with all the three coefficients being highly significant. Comparing the two groups of entrepreneurial and routinised sectors with a balanced firm population, the latter outperforms the former in each of the variables and comes first in terms of labour productivity growth and the level of current capital investment (see Table A.3 in Annex A). Not surprisingly, the routinised industries with an inertial but declining firm population (R-) are characterised by the least dynamic markets, experiencing the lowest growth of value added and employment, the lowest level of capital investment and a disappointing level of labour productivity.

In conclusion, the evidence on hypothesis H1 is mixed, suggesting a more complex pattern than initially anticipated. First, turnover and net entry rates are positively correlated, but we only find distinctly mutable populations when the number of firms is growing or balanced, whereas in inertial populations, the number of firms is either balanced or declining. Instances of inertial and growing, or mutable but declining firm populations are extremely rare. Second,

we find a distinctively higher growth of value added and employment among the dynamic subset of Schumpeter Mark 1 industries (E+), but also a distinctively higher growth of labour productivity among the dynamic subset of Schumpeter Mark 2 sectors. The two modes of 'entrepreneurial' and 'routinised' innovation apparently coexist and have a different impact on the overall dynamic characterisation of that industry. While industries in the entrepreneurial mode are more successful in expanding demand and hence production, the routinised sectors rely more on innovations that raise their productive efficiency. Second, net entry as a general proxy for entrepreneurial opportunity is not sufficient to capture differences in the sectoral dynamics, since among industries with a balanced firm population, the ones in the routinised mode clearly outperform the entrepreneurial ones. The analysis demonstrates that we must also take into account the overall mutability of the firm population, which reflects the different cost of experimentation (or entry). Since this is not a linear relationship, the new taxonomy was particularly instrumental in detecting that.

Turning to the profitability nexus, we want to assess which of the following three alternative hypotheses about the broad statistical association with our new sector types is consistent with the data:

- $H0_{prof}$ – *Opportunity-seeking entrepreneurship*: Industries with higher average profitability induce more opportunity-seeking entrepreneurship in terms of new firm creation. The bigger dynamics of fast-moving business environments also cause corporate turnover to rise. Consequently, profitability will be highest in the entrepreneurial industries characterised by a mutable firm population.

The above hypothesis implies that firms enter a market which is not in equilibrium and competition is less than perfect, since surplus profits are not instantaneously bid away. Imagining an equilibrium with (almost) perfect competition (i.e. with positive entry cost but no strategic interaction that leads to entry deterrence), the expected outcome is quite different:

- $H1_{prof}$ – *Equilibrium with (almost) perfect competition*: Competitive entry will occur as long as the discounted value of expected returns is higher than the entry cost. In equilibrium, surplus profits are bid away and industry types do not differ systematically in terms of average profitability.

The presence of market power establishes the most widely accepted deviation from perfect competition, where equilibrium outcomes have to adjust for the presence of entry barriers and strategic interaction, implying a relatively inertial firm population with low entry and turnover rates:

- $H2_{prof}$ – *Equilibrium with market power*: A sector's profitability rises with the height of entry barriers because these facilitate strategic interaction and entry deterrence. Consequently, we expect profitability to be highest in routinised industries with an inertial firm population.

Table A.4 in Annex A presents the according estimations for two different measures of "price-cost margins". First, we use the "operating surplus" (included in the OECD STAN database), which is defined as value added minus labour cost (payroll), and divide it by total value added. Our first proxy for price-cost margins (PCM1) thus provides an aggregate measure of profit before taxes, financial charges and depreciation. Even though it is a very crude

variable, it can be broadly interpreted as a firm's cash flow that can either be paid to the shareholders, used for raising reserve assets or for self-financing investments. Apparently, we critically miss capital costs to derive a variable that reflects profits more closely. Lacking reliable sectoral data on capital depreciation, for the second measure of price-cost margins (PCM2) we simply subtracted current expenditures on gross fixed capital investment. This variable proxies the cash flow after financing current capital investments, which is either available for the distribution of profit or for raising shareholder value through the build-up of equity capital and reserves.

The regression results show that the sector-type dummies from the new taxonomy significantly affect both measures of profitability. Both entrepreneurial types exhibit a higher price-cost margin than the comparison group of other industries, although the relative size of the coefficient differs depending on which measure is used. For PCM1, the coefficient is much higher in the group of entrepreneurial industries with a growing population (E+) as opposed to the ones with a balanced population (Eb). However, reflecting the bigger market dynamics, E+ industries also seem to exhibit higher levels of current investment, causing its coefficient to fall slightly below that of Eb industries in the second estimation with PCM2 as dependent variable. Also for routinised industries, the choice of the two measures on profitability makes a difference. While those with a balanced population (Rb) exhibit a negative coefficient in both regressions, it is only significant in the latter on PCM2. For industries with an inertial but declining population (R-), both coefficients are small and significant, but their sign switches from a negative effect on PCM1 to a positive impact on PCM2. Again, this can be explained by the different market dynamics, where routinised industries with declining populations also invest less than the comparison group of other sectors. Thus, the regressions in Table A.2 do not just prove the significant statistical association between profits and the firm demographic characteristics of the new taxonomy, but also highlight the crucial impact of different market dynamics on the two measures of profitability.

Table 4.4: OLS regression coefficients for industry types on growth and profitability

Independent variables	Entrepreneurial		Routinised		Other
	growing (E+)	balanced (Eb)	balanced (Rb)	declining (R-)	
Value added growth	0.04 (6.43)***	-0.03 (5.47)***	-0.00 (0.65)	-0.03 (9.21)***	c.g.
Employment growth	0.02 (3.11)***	-0.01 (1.00)	0.01 (1.30)	-0.03 (5.22)***	c.g.
Labour product. growth	-0.06 (7.06)***	-0.02 (2.90)***	0.01 (1.82)*	-0.01 (1.56)	c.g.
Labour product. level	-16.55 (4.34)***	-33.48 (10.96)***	-0.50 (0.20)	-18.48 (8.07)***	c.g.
Capital intensity	3.67 (5.26)***	-3.96 (7.77)***	3.79 (8.66)***	-4.62 (11.63)***	c.g.
Profitability(pcm1)	0.93 (11.49)***	0.13 (20.70)***	-0.04 (6.55)***	-0.01 (2.48)**	c.g.
Profitability(pcm2)	0.12 (11.28)***	0.17 (21.17)***	-0.04 (5.73)***	0.07 (10.26)***	c.g.

Absolute value of t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.
The complete regression results with all country and year effects are displayed in tables A.2 to A.4 in Annex A.

The regression also includes year dummies, but these were hardly significant and are therefore not displayed in the table. More interesting is the pattern of country effects, where we again take the USA as comparison group. In the first estimation on PCM1, all significant coefficients are positive while we find no country with a significant lower value than the USA. In the regressions on PCM2, we find four countries significantly below the US level, but still fourteen with a significant positive coefficient. Given the general perception of a very dynamic US economy in that period, this result is surprising. Because of our crude measures of profitability, different accounting practices are not likely to cause such a difference. One tentative explanation is that in the US competition is generally more intense, driving down prices and profits, but also raising demand and output. Finally, if we take a closer look again on the independent effect of being an Austrian sector, only the coefficient on the gross operating surplus (PCM 1) is significant and positive, indicating a higher average cash flow before financing current capital investments. Conversely, the coefficient on PCM2 (which includes current expenses on capital investment) is negative but not significant.

In conclusion, entrepreneurial industries with a mutable firm population exhibit a significantly higher profit ratio than the other sectors. This observation confirms the opportunity-seeking nature of entrepreneurship as proposed by the hypothesis $H0_{prof}$, strongly suggesting that *business start-ups will follow where opportunities for profit are high*. Conversely, based on this evidence, we must reject the idea that entry and firm turnover will generally bring markets close to the benchmark of perfect competition, or, alternatively, that routinised industries are more profitable because of their higher barriers to entry and exit. The latter result runs against much conventional wisdom on market structure and performance and therefore needs to be further scrutinised before it can be accepted as a general stylised fact.

Finally, the summary of the coefficients on the sector types in Table 4.4 offers an opportunity to recast the general characterisation of the distinct competitive regimes, combining information from the firm demographic- and performance-related variables:

- *Entrepreneurial industries with a mutable and growing population (E+)* present themselves as a particularly distinctive group, where the high growth of demand reduced competitive pressures, thus allowing the maintenance of high price-cost margins despite a growing number of firms and low productivity performance.
- In contrast, *entrepreneurial industries with a mutable but balanced population* (Eb) maintained above-average price-cost margins despite low growth and productivity performance. Only the low costs of market entry can explain the high level of entrepreneurial initiative, and many of the new enterprises are probably of a comparatively small scale.
- Considering its low profitability, *routinised industries with an inertial and balanced firm population* (Rb) appear to be mainly characterised by intense competition and a limited scope for expansion so that competitive performance typically depends on capital investment and productivity growth.

- Finally, *routinised industries with an inertial but declining firm population* (R-) exhibit weak profitability and the lowest growth of value added and employment. This class of industries is thus characterised by the particularly harsh competitive environment of intense competition and shrinking demand.

4.4. Summary and policy conclusions

To recapitulate, we have defined entrepreneurship as the pursuit and exploitation of profit opportunities within the context of market competition. Loosely speaking, entrepreneurs thrive on change since change is what offers new opportunities for profit. Although the creation of new firms is not the only instance, it is a particularly incisive act of entrepreneurial initiative, and it is the one on which this chapter focussed.

The opportunity-seeking nature of entrepreneurship can serve two very distinct but equally important functions for the economic system as a whole. First, as an *equilibrating force of market coordination*, 'Neo-Austrian' entrepreneurship is initiated by the alertness to and discovery of given imbalances, for instance in price/quantity relationships or with respect to inefficiencies in production. Entrepreneurial initiative thus brings prices closer to the level of a competitive equilibrium, spurs the adoption of superior technology, organisation, management or work practices and hence improves the overall allocation of resources to their most efficient uses. Second, as a *disequilibrating force of innovation*, 'Schumpeterian' entrepreneurship is the creative act of establishing novel combinations (with respect to resources, methods of production, goods, industrial organisation, and market access) that transform the existing means-ends framework and thus drive economic development in the long run.

The opportunity-seeking nature of entrepreneurship is associated with three fundamental sources of economic growth and development:

1. *Competition*: New (and potential) rivals bid down prices, limiting the leeway for anticompetitive behaviour in the market at given costs, and raising the cost discipline among incumbent firms. Consequently, lower prices induce additional demand and raise output.
2. *Innovation*: Corporate start-ups put new combinations of resources and ideas to a market test. More entry implies more experimentation and raises the probability of particularly successful combinations. As they discover and develop new market niches, start-ups contribute to greater diversity and quality of products and services.
3. *Structural adaptation*: Entry and exit foster the continuous regeneration of an economy's technological, managerial and entrepreneurial resources, thereby enhancing the adaptation of local production structures to continuous changes in technology and demand.

The scope and ambition of the empirical section is limited by the scarcity of data applicable for analytical purposes. Using a new database provided by the OECD firm-level study that offers sectoral data for ten countries, we investigated the link between the firms' demographic characteristics of net entry and turnover with growth in value added,

employment and labour productivity as well as the profitability of industries. Based on a distinction between opportunity and the cost of experimentation as major determinants of firm creation and destruction, we produced a new sectoral taxonomy that separates five industry types. The following regression analysis demonstrated that the growth nexus of entrepreneurship and entry is more complex than initially anticipated:

- Turnover and net entry rates are positively correlated, but we only find distinctly mutable populations when the number of firms is growing or balanced, whereas in inertial populations the number of firms is either balanced or declining. Instances of inertial and growing or mutable but declining firm populations are extremely rare.
- Growth of value added and employment is significantly higher among entrepreneurial industries with a mutable and growing firm population, but growth of labour productivity is best among routinised sectors with an inertial and balanced population. We conjecture that industries in the entrepreneurial mode are more successful in expanding demand and hence production, whereas routinised sectors rely more on innovations raising their productive efficiency.
- The analysis further highlights that net entry as a general proxy for entrepreneurial opportunity is not sufficient to capture these differences in the sectoral dynamics, but that we must also take into account differences in the overall mutability of the firm population, which reflect the varying costs of experimentation.

In contrast, the evidence on the nexus between average profitability and our firm demographic characteristics is more pronounced. Entrepreneurial industries with a mutable firm population generally exhibit a significantly higher profit ratio than other sectors. This observation confirms the opportunity-seeking nature of entrepreneurship as proposed by both the Neo-Austrian and the Schumpeterian tradition. In short, the empirical results strongly suggest that *business start-ups will follow where opportunities for profit are high*. Conversely, they lead us to reject the idea that entry and firm turnover will generally bring markets close to the benchmark of perfect competition. As a general guideline for economic policy, we conclude that *the effects of structural adaptation and innovation largely dominate the static competition effect. Entrepreneurship and start-up policies should primarily adopt a dynamic and long-term perspective to define its goals and assess the instruments.*

Given the fact that economic systems regularly experience entry of new firms in large numbers and accomplish the above functions of competition, structural adaptation and innovation more or less effectively, but mostly based on self-organising mechanisms, the particular task of public policy in that process is not self-evident. On the one hand, many critical variables affecting firm entry and the viability of business start-ups cannot be influenced by public intervention. On the other hand, the industrial dynamics that become apparent in high start-up rates are the joint outcome of the many factors that make up the business environment and have an impact on profit opportunities.

In its recent and very extensive report on entrepreneurship policy the OECD concludes that in "most cases the direct influence of public policy on regional start-up rates appears negligible" (OECD, 2003d, p. 40) and argues that market failure may be less frequent than

generally expected. It is particularly sceptical about the use of entrepreneurship programmes as a means of labour market policies:

> "The magnitude of direct employment effects will generally be small, especially over the short-term. This reflects the small average size of start-ups, low enterprise survival and growth rates, displacement effects, and deadweight in programme outcomes. Self-employment support programmes in particular tend not to produce a large multiplier effect, because the self-employed do not hire large numbers of additional workers. However, this and other parts of the report note that an unqualified focus on employment outcomes is mistaken. Enterprise creation is part of a broader process in which financial, human and other resources should be efficiently reallocated from declining firms and subsectors to uses that markets value more highly" (OECD, 2003, p. 14f).

Nevertheless, as not only the OECD concedes, policy still matters for a variety of reasons. There is the undisputed general responsibility for legal security, reliable and efficient public institutions, a transparent and fair tax system, the protection of property rights and other critical features of the overall *business environment*. In addition, other kinds of public intervention, which are not directly aimed at business start-ups, nevertheless have an impact on entrepreneurship. Examples are policies directed at macroeconomic stabilisation, the general system of education and training, or policies directed at research and technological innovation. Another case in point is *competition policy*. It affects entrepreneurship and start-ups more directly, as the ease of entry and the contestability of a market go hand in hand. While competition policy is discussed in a separate chapter of this report, at this place we only stress the general need to closely scrutinise existing legal and other entry barriers with the aim of removing them wherever possible.

With respect to entry barriers due to *bureaucratic procedures*, the Doing Business Project of the World Bank Group[18] documents the results of a survey in 130 economies on official requirements that must be met before entrepreneurs can legally start their business. Choosing a representative SME (small and medium-sized enterprise), the survey assumes efficient compliance with all the rules by the applicant and an efficient administration that proceeds at the minimum time without any delays by the regulatory bodies. Djankov et al. (2002) offer a detailed description of the methodology and use the data to evaluate economic theories of regulation. They find no evidence that stricter regulation would enhance product quality, environmental and health standards, or keener competition, but report a positive association with levels of corruption and the relative size of the unofficial economy. Countries with less burdensome entry regulation also tend to offer more open access to political power, greater constraints on the executive, and greater political rights. Controlling for per capita income, their data lead them to conclude that entry is regulated because doing so benefits the regulators (which is to say that permits and regulations primarily exist to give officials the power to deny them).

The study also demonstrates that countries differ enormously in terms of bureaucratic procedures to incorporate and register a new firm:

[18] See http://rru.worldbank.org/DoingBusiness/TopicReports.

> "To meet government requirements for starting to operate a business in Mozambique, an entrepreneur must complete 19 procedures taking at least 149 business days and pay US$256 in fees. To do the same, an entrepreneur in Italy needs to follow 16 different procedures, pay US$ 3,946 in fees and wait at least 62 business days to acquire the necessary permits. In contrast, an entrepreneur in Canada can finish the process in 2 days by paying US$ 280 in fees and completing only 2 procedures" (*Djankov* et al., 2002, p. 1).

In general, the burden of official entry procedures tends to be negatively associated with the level of a country's economic development. According to the data provided by the Austrian Institute for SME Research, Austria holds an intermediate position among the EU15 member states, with altogether nine procedures taking at least 29 days and amounting to € 1,630. While this is much better than for instance the process in Italy (see above), France (15 procedures/53 days), or Germany (10/42), there is still much room for improvement, if we take Denmark (3 procedures/3 days), Ireland (3/16), or the UK (5/4) as best practice benchmarks within the EU.

Bureaucratic requirements can be cumbersome and distracting to entrepreneurs, who should make better use of their time and focus on their proper business activity. However, one may doubt that in the more developed countries with a modest to intermediate regulatory burden such bureaucratic procedures actually deter serious entrepreneurs from entering the market. The more important concern is about regulations that block entry by legal *restrictions on market access,* as is still the case, for instance, in the 'liberal' professions. While such entry barriers directly reduce the opportunity for entrepreneurship and business start-ups in that respective market, there is additional concern from the perspective of entrepreneurship policy. In many instances, the failure of start-up companies cannot be attributed simply to a general lack of entrepreneurial potential among the founders of the firm. Instead, the failure is only caused by their inexperience – which is a natural handicap for nascent entrepreneurs, and could often be alleviated by external advice and consulting during the initial stages of the new venture. Especially in legal and related professions, the removal of barriers from existing entry regulations offers an opportunity to improve in this matter. An increasing number of competitors among these professional services will not just raise entry within this industry, but also drive down prices and increase incentives for additional differentiation and specialisation of their services. We may therefore optimistically believe that a private and professional market of affordable consulting services specifically tailored to the needs of business start-ups might emerge and grow if barriers to market access in these professions are lifted.

Among the vast array of targets for policy intervention, three targets appear to be particularly relevant:

- *Human resources*: Specific education and training for nascent entrepreneurs is frequently quoted as an important target to foster entrepreneurship and has lead to a growing number of special curricula at universities and business colleges in recent years. In most instances, the life span is still too short for a proper evaluation. However, the training of entrepreneurial capabilities at the level of graduate students might only touch the "tip of the iceberg". The bigger issue we have to face is how to incorporate entrepreneurial virtues such as self-reliance, initiative, or the counterfactual

perception of opportunities into ordinary curricula from the earliest levels of schooling onwards.

- *Financial resources*: Start-up firms may face considerable financial constraints that arise from market failure in the form of asymmetric information. The more the would-be entrepreneurs lack reputation, experience, and - most importantly - collateral, creditors are reluctant to bear the associated business risks. Under the new Basel Capital Accord, this problem tends to be aggravated, as banks are required to apply stricter rules on their risk assessment and risk management.[19] However, it is also relevant for external equity finance. The large majority thereof is consequently brought up by the limited resources of informal investors such as family and friends. Public policy instruments in the form of specific loan and guarantee schemes are generally well developed. What deserves more attention is the much smaller venture capital market, targeting the important segment of financing companies with particularly high growth potential.[20]
- *Public awareness*: As the *OECD* (2003d, p. 134) argues, a "favourable public perception of entrepreneurship will help to underpin entrepreneurial activity." Besides the typical awareness-raising initiatives such as business plan contests and start-up awards, an annual, concise and well-drafted national report on entrepreneurship and entry might simultaneously help the pursuit of two goals. First, it enables systematic research on the topic, raising our knowledge and thus helping to target entrepreneurship policies more carefully. Second, it raises the agenda of entrepreneurship and start-up policies both within the broader public as well as among the more involved actors in related policy fields.

In the context of the current Austrian situation, the latter suggestion would however collapse due to the lack of internationally comparable data. We therefore explicitly endorse the importance of an Austrian participation in international initiatives such as the OECD firm-level study or the Global Entrepreneurship Monitor (GEM).

Finally, the OECD (2003) offers a number of general principles with respect to programme design, which intend to make the policy process more effective. We shall briefly mention only the most distinctive among them. To begin with, the OECD argues strongly in favour of a "positive bias towards the adoption of commercial approaches to expanding entrepreneurship"[21] and enumerates five specific reasons:

(i) to avoid displacing private suppliers (crowding-out);

(ii) to avoid distortions between beneficiaries and other firms;

(iii) because both the quality and efficiency of a programme benefit from being receptive to market signals;

[19] See Basel Committee on Banking Supervision (2003).

[20] See also Peneder – Wieser (2002).

[21] This means, "for instance, that the private provision of services should be favoured over public supply. Regulation to expand the supply of services should be sought before subsidisation. Loans should be considered over grants. Lending should have a last-resort function. And loan guarantees should be examined before loans" (OECD, 2003, p. 129).

(iv) because markets can mobilise additional resources; and

(v) because market orientation improves the sustainability and overall impact of a support programme.

In the same report, the OECD reminds policymakers to demand for more transparency and an explicit strategic orientation in order to maintain focus and momentum within the large variety of different programmes.[22] The report further stresses that new aims should be incorporated into existing organisations instead of the creation of new ones in order to avoid duplication of effort. Finally, it is argued that self-employment and micro-enterprise support schemes "should be designed such that budgets and capacities can be expanded during economic downturns, which usually raise demand for programme service" (OECD, 2003d, p. 27). It would certainly not be adequate to judge the relative compliance of Austrian entrepreneurship policies with these general rules without a proper and detailed prior evaluation of the specific policy programmes that are currently in operation. Nevertheless, it is safe to conclude that Austria (as probably many other nations) could greatly benefit from a strict adherence to these principles of effective policy design.

[22] "In many countries an ensemble of programmes and institutions aims to meet diverse and changing objectives that may not be mutually coherent. Different goals are frequently pursued simultaneously, with little strategic specification. A transparent and logical alignment is needed between programmes and objectives. Making strategies explicit will also help to assess their feasibility prior to implementation, to make policy trade-offs clear, and to provide a framework for evaluations of policy" (OECD, 2003, p. 21).

Annex A: Cluster validation

Table A.1: OLS regression of turnover and net entry on sector type and country effects

	Turnover-comp.	**Turnover-empl.**	**Net entry-comp.**	**Net entry-empl.**
Const.	17.598	4.129	-0.457	-0.874
	(16.42)**	(6.45)**	(0.64)	(2.52)*
Sector types (R- is comparison group)				
E+	7.491	4.670	5.244	2.126
	(5.66)**	(5.90)**	(5.96)**	(4.97)**
E(b)	2.039	2.487	1.703	0.889
	(1.78)	(3.64)**	(2.24)*	(2.40)*
Other	0.264	0.347	2.444	0.956
	(0.31)	(0.68)	(4.29)**	(3.45)**
R(b)	-3.362	-1.374	1.362	1.105
	(3.11)**	(2.13)*	(1.89)	(3.16)**
Countries (USA is comparison group)				
CAN	4.190	4.700	2.112	0.854
	(3.74)**	(7.02)**	(2.84)**	(2.36)*
UKD	3.899	-1.277	0.602	-0.012
	(3.41)**	(1.87)	(0.79)	(0.03)
FRA	19.887	11.101	9.969	-0.453
	(14.50)**	(13.55)**	(10.94)**	(1.02)
GER(w)	4.463	3.936	2.806	-0.068
	(3.97)**	(5.85)**	(3.75)**	(0.19)
NED	-3.372	-0.857	-2.343	0.727
	(2.37)*	(1.01)	(2.48)*	(1.58)
DEN	4.127	5.333	1.271	-0.032
	(3.76)**	(8.13)**	(1.74)	(0.09)
FIN	3.795	6.698	-4.363	-0.393
	(2.99)**	(8.85)**	(5.18)**	(0.96)
ITA	-3.375	4.096	1.542	1.168
	(2.95)**	(5.99)**	(2.03)*	(3.16)**
POR	-1.017	3.088	0.089	0.836
	(0.91)	(4.63)**	(0.12)	(2.32)*
Observations	450	450	450	450
R-squared	0.49	0.49	0.39	0.12

Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%;
NB: E+ = entrepreneurial growing; E(b) = entrepreneurial balanced; R(b) = routinised balanced; R- = routinised declining.

Table A.2: OLS regression of country, time and industry effects on average growth rates

		Labour productivity	Value added	Employment
Constant		0.1040 (-10.43)***	0.154 (20.77)**	0.015 (1.62)
Country effects	AUT	-0.016 (1.43)	-0.060 (6.72)**	-0.006 (0.55)
(USA dropped)	BEL	-0.032 (2.58)**	-0.066 (7.48)**	-0.008 (0.76)
	CAN	-0.002 (0.10)	-0.057 (4.83)**	0.015 (0.99)
	CZR	-0.045 (2.34)**	-0.001 (0.12)	-0.032 (2.32)*
	DEN	-0.010 (0.90	-0.056 (6.39)**	-0.010 (0.99)
	ESP	-0.024 (2.01)**	-0.038 (4.24)**	0.008 (0.74)
	FIN	-0.009 (0.80)	-0.038 (4.33)**	0.005 (0.47)
	FRA	-0.014 (1.27)	-0.071 (7.97)**	-0.007 (0.70)
	GER	-0.018 (1.61)	-0.086 (9.84)**	-0.021 (2.05)*
	HUN	-0.035 (1.10)	-0.009 (1.04)	-0.003 (0.19)
	ITA	-0.008 (0.70)	-0.046 (5.24)**	-0.004 (0.41)
	JAP	-0.010 (0.86)	-0.031 (3.46)**	-0.028 (2.61)**
	KOR	0.003 (0.23)	0.012 (1.30)	-0.001 (0.04)
	LUX	-0.018 (1.41)	-0.030 (3.23)**	0.014 (1.22)
	MEX	0.020 (1.52)	0.024 (2.69)**	0.004 (0.38)
	NED	-0.012 (1.06)	-0.054 (5.94)**	0.001 (0.14)
	NOR	-0.006 (0.52)	-0.035 (3.96)**	-0.001 (0.07)
	NZL	-0.037 (1.78)*	-0.018 (1.82)	0.004 (0.20)
	POL	-0.041 (1.95)*	0.041 (4.51)**	-0.012 (0.92)
	POR	-0.019 (1.42)	-0.033 (3.66)**	-0.004 (0.33)
	SKR	-0.056 (1.10)	0.004 (0.44)	0.010 (0.41)
	SWE	-0.009 (0.73)	-0.059 (6.52)**	-0.002 (0.19)
	UKD	-0.022 (1.37)	-0.027 (3.07)**	-0.012 (0.85)
Year dummies	1992/93	-0.285 (29.93***	-0.048 (8.62)**	-0.247 (29.68)**
(1999/2000	1993/94	-0.157 (19.38)***	-0.034 (6.21)**	-0.017 (2.43)*
dropped)	1994/95	-0.055 (6.81)***	-0.065 (12.02)**	-0.002 (0.32)
	1995/96	-0.054 (6.84)***	-0.055 (10.11)**	-0.005 (0.72)
	1996/97	-0.023 (2.90)***	-0.026 (4.83)**	0.005 (0.76)
	1997/98	-0.070 (8.77)***	-0.097 (17.81)**	0.001 (0.11)
	1998/99	-0.030 (3.75)***	-0.048 (8.79)**	-0.002 (0.25)
Industry types	Entrepreneurial +	-0.064 (7.06)***	0.036 (6.43)**	0.025 (3.11)**
("Other"	Entrepren. balanced	-0.021 (2.90)***	-0.026 (5.47)**	-0.006 (1.00)
dropped)	Routinised balanced	0.011 (1.82)*	-0.003 (0.65)	0.007 (1.30)
	Routinised -	-0.009 (1.56)	-0.033 (9.21)**	-0.025 (5.22)**
	Observations	7667	11532	8287
	R-squared	0.16	0.09	0.15

Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%

Table A.3: OLS regression on labour productivity and capital intensity

		Labour productivity	Capital intensity
Constant		97.811 (23.33)**	15.065 (22.65)**
Country effects	AUT	-16.550 (3.46)**	-1.552 (2.19)*
(USA dropped)	BEL	-21.699 (4.23)**	0.357 (0.45)
	CAN	-34.943 (5.05)**	-4.355 (3.97)**
	CZR	-70.372 (8.61)**	-8.244 (6.85)**
	DEN	-11.682 (2.46) *	0.432 (0.50)**
	ESP	-35.433 (6.99) **	-7.015 (8.29)**
	FIN	-26.234 (5.56) **	-3.256 (4.67)**
	FRA	-14.256 (2.99) **	-2.459 (3.16)**
	GER	-17.571 (3.73) **	-2.206 (3.15)**
	HUN	-63.712 (4.81) **	-7.131 (3.66)**
	ITA	-22.254 (4.70) **	-1.578 (2.20)*
	JAP	11.314 (2.24) *	n.v.
	KOR	-51.505 (8.39) **	-1.967 (1.87)
	LUX	15.552 (2.86) **	n.v.
	MEX	-54.877 (10.18) **	n.v.
	NED	-2.734 (0.56)	-0.096 (0.13)
	NOR	-3.235 (0.68)	-3.142 (4.41)**
	NZL	10.751 (1.24)	6.296 (3.98)**
	POL	-70.583 (8.07) **	-10.216 (7.44)**
	POR	-57.636 (10.21) **	-6.264 (5.01)**
	SKR	-64.546 (3.00) **	-2.871 (0.91)
	SWE	-16.683 (3.24) **	0.280 (0.36)
	UKD	-21.779 (3.24) **	-3.251 (3.27)**
Year dummies	1992/93	-28.387 (7.10) **	-5.401 (7.76)**
(1999/2000	1993/94	-17.417 (5.11) **	-4.083 (6.74)**
dropped)	1994/95	-12.559 (3.71) **	-3.207 (5.37)**
	1995/96	-11.219 (3.36) **	-2.420 (4.10)**
	1996/97	-7.615 (2.27) *	-1.657 (2.78)**
	1997/98	-8.106 (2.42) *	-1.128 (1.87)
	1998/99	-3.600 (1.07)	-0.912 (1.51)
Industry types	Entrepreneurial +	-16.552 (4.34) **	3.673 (5.26)**
(R- dropped)	Entrepren. balanced	-33.477 (10.96) **	-3.963 (7.77)**
	Other	-0.501 (0.20) **	3.786 (8.66)**
	Routinised balanced	-18.483 (8.07) **	-4.620 (11.63)**
	Observations	7667	5495
	R-squared	0.09	0.12

Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%

Table A.4: OLS regression of country, time and industry effects on price-cost margins

		PCM 1	PCM 2
Constant		0.203 (18.47)**	0.033 (2.68)**
Country effects	AUT	0.037 (3.02)**	-0.023 (1.86)
(USA dropped)	BEL	0.032 (2.02)*	-0.026 (1.60)
	CAN	0.114 (7.56)**	0.136 (7.71)**
	CZR	0.035 (2.79)**	-0.117 (8.53)**
	DEN	0.184 (14.94)**	0.127 (8.16)**
	ESP	0.200 (13.72)**	0.186 (10.24)**
	FIN	0.044 (3.58)**	0.017 (1.32)
	FRA	0.135 (11.14)**	0.130 (9.56)**
	GER	-0.021 (1.73)	-0.073 (5.79)**
	HUN	0.200 (14.86)**	0.099 (4.64)**
	ITA	0.122 (8.75)**	0.063 (4.38)**
	JAP	-0.017 (1.03)	n.v.
	KOR	0.112 (9.01)**	-0.077 (5.14)**
	LUX	0.071 (4.94)**	n.v.
	MEX	0.436 (34.16)**	0.702 (3.56)**
	NED	0.238 (18.41)**	0.153 (11.36)**
	NOR	0.031 (2.52)*	0.049 (2.54)*
	NZL	0.255 (17.37)**	0.208 (10.81)**
	POL	0.146 (11.66)**	0.131 (9.45)**
	POR	0.221 (17.82)**	0.138 (6.30)**
	SKR	0.025 (1.89)	-0.105 (7.42)**
	SWE	0.186 (12.96)**	0.158 (10.40)**
	UKD	0.151 (12.50)**	0.142 (11.02)**
	USA (dropped)		
Industry types	Entrepreneurial +	0.927 (11.49)**	0.124 (11.28)**
("Other"	Entrepreneurial balanced	0.133 (20.70)**	0.168 (21.17)**
dropped)	Other (dropped)		
	Routinised balanced	-0.038 (6.55)	-0.042 (5.73)**
	Routinised -	-0.013 (2.48)*	0.069 (10.26)**
	Year dummies (1992-2000)	Yes	Yes
	Observations	10339	6800
	R-squared	0.28	0.26

Note: Absolute value of t statistics in parentheses; * significant at 5%; ** significant at 1%; pcm1 = gross operating surplus / value added; pcm2 = (gross operating surplus – gross fixed capital formation) / value added.

5. Conclusions and policy implications

The objective of the chapter was firstly, to identify the main reasons for low growth in Europe and specifically the loss of the Austrian growth differential relative to the EU average since 1995 and secondly, to make proposals on how to accelerate growth.

For this purpose, we developed and estimated a model explaining economic growth across 21 OECD countries for the period 1980–2002. The model is based on the theory of economic growth and its specification makes use of the existing and growing empirical literature explaining the growth differences of countries. In emphasising the innovation sector and other aspects of the Lisbon agenda, it focuses on the aspects specifically important for Austria. ICT patents as a determinant of growth and indicators of the volatility of growth are added. We specifically compared Austrian growth and its underlying factors not only to the European average, but also to countries with sustained high growth over the past 10 years. This "upper benchmark" for high and innovation-based growth consists of Sweden, Finland and Denmark. These "top 3 countries" succeeded to grow by 2.4% over 1995-2002 on a per capita basis, as compared to 1.9% in the EU average. The ratio for research expenditures relative to GDP is 3.4% (unweighted average), surpassing the Lisbon target for 2010.

Briefly, the result of the baseline model is that investment, research expenditures, and lagged income are significantly related to growth. Human capital is weakly positively related to growth. The measurement of human capital by the average years of schooling may underscore its contribution since it does not account for educational quality. In addition, growth is related to the share of patents in the ICT sector, it is negatively related to the size of government, but this effect depends on the type of expenditure, and there is feedback from growth to expenditure. Growth is also related to regulation as measured by the degree of liberalisation of network industries.

Economic growth in Austria had been higher than the EU average until 1995. This lead to the position of Austria as one of the five economies with the highest per capita income, giving Austria a lead of more than 10% versus the EU average. Since 1995, Austrian growth has mirrored approximately that of the EU, while income per capita and per working force has been slightly below the EU average. The differential in per capita income therefore narrowed a little bit and is now between 9% and 10% (per capita and per workforce, respectively), approximately back to the country's lead in 1990.

Actual annual growth per capita in Austria over the past 10 years was 1.8%, and our model predicts a growth rate of 2.1% indicating some inefficiency in production. The contribution to growth by human capital was 0.3%, and the same impact came from increasing business research expenditures. Liberalisation of network industries and ICT investment contributed 0.1% each. The impact of the growth drivers together sums up to a growth contribution of 0.8% for Austria. For the top three countries, these factors contribute 1.1% to annual growth. Thus, this group of variables can account for half of the growth difference between Austria and the top three countries.

Austrian growth did not profit from physical investment. The investment ratio was stable, with public investment decreasing relative to GDP. The overall investment ratio is still 2 percentage points higher than the EU average, the 3rd highest in Europe after Portugal and Spain, and it is

furthermore 3% higher than in the top 3 countries. A high share of physical investment and a low share or medium share in investment in intangibles is no favourable structure for high-income countries.

Another factor for different growth performance in the European Union could be administrative regulations concerning start-ups. In Austria, the regulation costs of new businesses are the highest in the European Union. Competitive pressure, internationalisation and new business start-ups specifically in services sectors would increase growth. Competition policy should specifically focus on industries where a monopoly position exists, threatens to be built up or to return. Furthermore, competition policy is important where potential competitors are discouraged or excluded and where innovation is dependant on the entry of new firms.

On the demand side, Austria lost 0.3 percentage points growth due to the sluggish performance in Germany, and high exports into the new member countries could compensate this only partly (by 0.1 percentage points per year). Investment in the economies of the new member states would be specifically positive for Austria. Consumption growth was low, partly since the savings rate has increased in recent years, while decreasing saving rates of households have become a stylised factor of fast growing economies. Incentives for consumer investments and increasing income specifically in the low-income range could foster growth. Policy elements that contributed to the low volatility of consumption should be maintained. Larger investment in infrastructure and an earlier and more courageous start of the planned European infrastructure programmes (European Growth Initiative) would increase demand and improve infrastructure.

The findings of this study underline the importance of the Lisbon strategy to upgrade economic growth by innovation and education, but also to complement this approach by investment in physical and intangible infrastructure. The cost of new business regulation should be reduced and competition enforced. Strategies to boost entry are offering training for nascent entrepreneurs, loans, guarantees and equity for new firms (specifically in an environment where the new Basel Capital Accord requests stricter rules for risk assessment and management) and increasing public awareness for entrepreneurship. Altogether, the strategies listed in this study can boost economic growth, which is necessary to increase employment in Austria and to return to an above-average growth path. Parallel growth-oriented strategies on the EU level should help to close the current growth differential of Europe with respect to the US and Asia.

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