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Austria 2025:

Corporate Investment in Austria

Stylised Facts, Impacts, Determinants and Investment Policies

Martin Falk

December 2016

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AUSTRIAN INSTITUTE OF ECONOMIC RESEARCH

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Abstract

This study provides an overview of the structure and development of investments in equipment and intangible assets in Austria as well as in the EU countries. In addition, investment climate factors and the main investment determinants (corporation tax, depreciation regulation, investment grants) are taken into account. A comprehensive empirical analysis of the effects and determinants of equipment investments in the enterprise sector is carried out. In the EU countries, the most common tax measures are the reduction of corporate taxes, followed by the expansion of tax incentives for R&D activities. Accelerated depreciation regimes and tax credits for investments are less frequently used. The results show that the total contribution of fixed assets to value added in constant prices amounts to 0.5 percentage point per year between 2010 and 2014. Of the different types of capital, intangible assets have the highest growth contribution (0.3 percentage point per year on average). For the group of highly developed industrialised countries, corporate taxation has a significantly negative impact on capital growth. The introduction of the patent/IP box is associated with an increase in domestic investment in intangible assets (for example in Belgium) or with a rise in domestic direct investment in R&D, design and technical services (e.g. in the Netherlands). Based on the results, a strategy to increase equipment investment is presented.

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Zusammenfassung

Stilisierte Fakten zu den Investitionen

- In Österreich beträgt das Verhältnis der Investitionen in Maschinen, Anlagen und geistiges Eigentum (IPP) zum BIP etwa 12 % und hat sich seit 2008 wenig verändert. Während der Wirtschafts- und Finanzkrise war der Rückgang der Ausrüstungsinvestitionen in Österreich weniger ausgeprägt als in anderen EU-Ländern mit ähnlicher Größe und BIP pro Kopf. Die Einführung der vorzeitigen Abschreibung in den Jahren 2009/2010 hat zur relativ günstigen Entwicklung der Ausrüstungsinvestitionen beigetragen. Dies gilt vor allem für die Sachgütererzeugung.
- Der Anteil der Investitionen in Maschinen, Anlagen und geistiges Eigentum (IP) ist in Österreich etwas höher als in der Gruppe der EU-6 Länder (BE, DK, FI, IR, NL und SE) mit ähnlicher Größe und BIP pro Kopf (mit einer Differenz von einem Prozentpunkt). Die höhere Ausrüstungsinvestitionsquote in Österreich im Vergleich zu diesen EU-Ländern ist auf die höheren Investitionen in Ausrüstungen und Maschinen und nicht auf Investitionen in geistiges Eigentum zurückzuführen. Höhere Investitionen in Ausrüstungen und Maschinen sind teilweise auf den in Österreich relativ hohen Anteil von kapitalintensiven Industrien in der Sachgütererzeugung zurückzuführen.
- Betrachtet man ausschließlich den Anteil der Investitionen in Maschinen und Anlagen (ohne Investitionen in geistiges Eigentum) so ist ein Rückgang der Investitionsquote ab 2008 festzustellen. Die rückläufige Investitionsquote kann in allen Industrieländern beobachtet werden. Dies gilt sowohl für technologisch führende Industrieländer (Korea, Schweiz) als auch für die weniger entwickelten EU-Länder.
- In fortgeschrittenen Industrieländern verschiebt sich die Struktur der Investitionen immer stärker in Richtung von Investitionen in geistiges Eigentum (IP) (Software, Datenbanken, F&E, Exploration, Unterhaltung, Literatur oder Kunst). In Österreich ist der Anteil der Investitionen in geistiges Eigentum am höchsten in der Sachgütererzeugung (47%), Informations-

und Kommunikationsdienstleistungen (56 %) und Finanzdienstleistungen (47 %) gemessen als Durchschnitt für den Zeitraum 2010-2014.

- In den letzten Jahren hat der Anteil der Investitionen in geistiges Eigentum an den Gesamtinvestitionen in fast allen Branchen zugenommen. Der stärkste Anstieg ist in der Sachgütererzeugung (+6 Prozentpunkte) zu beobachten, gefolgt von Informations- und Kommunikationsdiensten (+12 Prozentpunkte), freiberuflichen und technischen Dienstleistungen (+5 Prozentpunkte), Bausektor (+8 Prozentpunkte), und Groß- und Einzelhandel (+3 Prozentpunkte) (basierend auf einem Vergleich vor und nach der Wirtschafts- und Finanzkrise, also Mittelwert 2010 bis 2014 im Vergleich zu Mittelwert 2005 bis 2008).
- In Österreich wird in geistiges Eigentum weniger investiert als in der Gruppe der Vergleichsländer (BE, DK, FI, NL, IE und SE). Die Differenz beträgt 0,4 Prozentpunkte in 2014 (4,5 vs. 4,9 %). Deutlicher wird die Differenz im Vergleich zu den führenden Industrieländern (USA, Südkorea und Schweiz), welche einen Anteil von IP-Investitionen zwischen 5 und 6 % aufweisen. Bei diesen Investitionen hat sich der Abstand zwischen Österreich und der Gruppe der Vergleichsländer im Zeitablauf leicht verringert. Dies ist vor allem auf höhere Investitionen in Forschung und Entwicklung zurückzuführen.
- Das reale Anlagevermögen von Ausrüstungen und Maschinen entwickelt sich mit einer ähnlicher Wachstumsrate wie die der realen Wertschöpfung. Dies deutet auf eine konstante Kapitalproduktivität hin. Wie erwartet, ist die Dynamik des Anlagevermögens je nach Typ sehr heterogen. Während das Anlagevermögen in geistiges Eigentum (in konstanten Preisen) im Durchschnitt um 6 % pro Jahr zwischen 2005-2014 steigt, erhöht sich das Anlagevermögen in Maschinen und Anlagen mit einer Wachstumsrate von 0,5 und 1 % pro Jahr im Durchschnitt nur geringfügig.

Stilisierte Fakten zu der Entwicklung der Bestimmungsfaktoren der Investitionen und Investitionsklimafaktoren

- Investitionen werden durch eine Vielzahl von Faktoren bestimmt. Dazu zählen Anschaffungskosten für neue Investitionen, Zinssätze, Abschreibungssätze und Abschreibungsregelungen, Körperschaftssteuer, erwartete Gewinne, Finanzierungsbedingungen, Investitionszuschüsse und allgemeine Investitions- und Geschäftsklimafaktoren.
- Skandinavische Länder, Belgien, Irland und die Niederlande geben mehr als viermal so viel für öffentliche Zuschüsse für Investitionen im Unternehmenssektor aus, die Schweiz sogar zehnmal so viel wie Österreich. Im Vergleich zum Zeitraum vor der Finanz- und Wirtschaftskrise sind in Österreich die öffentlichen Investitionszuschüsse für Unternehmen gemessen am BIP um mehr als 70 % gekürzt worden (von 0,2 % auf 0,07 %) und damit stärker als in jedem anderen EU-Land mit ähnlicher Wirtschaftsleistung und Größe.
- Die Leistungsberichte der AWS zeigen ein ähnliches Bild: Im Vergleich zum Zeitraum vor der Wirtschafts- und Finanzkrise liegt der Barwert der Investitionsförderung für Unternehmen bei etwas mehr als der Hälfte (in nominellen Preisen).
- In Österreich ist die lineare Abschreibung gesetzlich festgelegt. Im Vergleich zu anderen EU-Ländern fällt Österreich damit in eine Gruppe von Ländern mit den am wenigsten großzügigen Abschreibungsregelungen gehört. Die Mehrheit der fortgeschrittenen europäischen Ländern (BE, CH, DK, LU, SE, FI und UK) erlaubt verschiedene Möglichkeiten für die Abschreibung (degressive, beschleunigte Abschreibung, sinkende oder gepoolte bzw. gemischte Lösungen).
- In Österreich sind zwischen 2010 und 2015 drei Investitionsstimulierende und drei Investitionsdämpfende Maßnahmen getroffen wurden. Zu den stimulierenden Maßnahmen zählen (i) Erhöhung des Steuerfreibetrags für nicht eingetragene Unternehmen (Steuernachlässe für Einzelunternehmen), (ii) Entfernung des Verlustvortrages (Grenze von 75 %) und Abschaffung der Verlustausgleichsgrenze, und (iii) Erhöhung der F&E-

Prämie von 10 auf 12%. Zu den gegenläufigen Maßnahmen zählen: (i) Absetzbarkeit für Verluste in ausländischen Tochtergesellschaften, Reduktion des steuerlichen Verlustausgleich bei Gruppenbesteuerung, (ii) Abschaffung der Bildungsprämie und Bildungsfreibetrag und die Begrenzung der Erstattung der Beiträge, und (iii) Erweiterung der Nichtabzugsfähigkeit bestimmter Zinsen und Lizenzgebühren.

- In den EU-Ländern ist die Senkung der Unternehmenssteuersätze (24 Einzelmaßnahmen zwischen 2010 und 2015) eindeutig die häufigste Maßnahme im Bereich der Unternehmenssteuern. Andere Maßnahmen (beschleunigte Abschreibung, vorzeitige Abschreibung, Investitionssteuergutschriften) sind weniger verbreitet. Diese Maßnahmen sind in den meisten Fällen befristet und werden in Phasen schwacher oder rückläufiger Investitionen eingeführt.
- In den EU-Ländern mit ähnlichen Bevölkerung und BIP pro Kopf (EU-6) verringerte sich der effektive Durchschnittssteuersatz (EATR) von 24 % auf 21 % zwischen 2005 und 2014. In Österreich dagegen ist der EATR bei etwa 23 % im gleichen Zeitraum stabil gewesen. Derzeit liegt in Österreich die EATR um 2 Prozentpunkte höher als in den EU-Ländern mit ähnlicher Größe und Pro-Kopf BIP. Die Lücke in der EATR wird in den kommenden Jahren weiter steigen, da mehrere Länder in dieser Gruppe weitere Kürzungen des Körperschaftsteuersatzes angekündigt haben. Die steigende Differenz in den Steuersätzen erhöht den Druck die Steuersätze auf das Niveau dieser Ländergruppe anzupassen („Race to the bottom"). Empirische Ergebnisse zeigen, dass es eine signifikante Beziehung zwischen dem Körperschaftsteuersatz und den Investitionen gibt. Dies gilt sowohl für die inländischen Investitionen als auch für ausländische Direktinvestitionen und auch für hochentwickelte Industrieländer.
- Maßnahmen im Bereich der Unternehmenssteuer haben in den meisten Fällen keinen exklusiven KMU-Fokus. Dies gilt auch für Untergruppen von KMUs (junge Unternehmen, Start-ups, Kleinstunternehmen und kleine

Unternehmen). Nur acht Maßnahmen im Bereich der Unternehmenssteuern in der EU-28 zwischen 2010 und 2015 sind ausschließlich auf KMUs ausgerichtet. Bevorzugte steuerliche Behandlung von KMUs sollte kritisch betrachtet werden, da sie einen Anreiz darstellen nicht über bestimmte Schwellenwerte hinaus zu wachsen.

- Finanzierungsbedingungen für Investitionen haben sich in den letzten Jahren stark verbessert. Langfristige Zinsen verharren auf einem historisch niedrigen Niveau. Allerdings sind langfristige Zinsen immer weniger relevant für die Investitionsentscheidung. Zugang zu Bankfinanzierung stellt kein Hindernis für Finanzierung von Investitionen dar. Der Anteil der Unternehmen, welche die Kreditvergabe der Banken als restriktiv betrachten, ist laut WIFO-Konjunkturtest ab 2011 stetig zurückgegangen (von 47% auf 37%).
- In Österreich haben sich die Geschäfts- und Investitionsklima-Faktoren relativ ungleichmäßig im Zeitablauf entwickelt. Zwar gibt es einen starken Rückgang der Kosten für die Gründung eines Unternehmens, andere Geschäftsklimafaktoren haben sich dagegen in den letzten Jahren ungünstig entwickelt (zum Beispiel Kosten für die Durchsetzung von Verträgen). Fortschritte sind auch bei der gesamten Abgabenlast für Unternehmen festzustellen. Allerdings ist die gesamte Abgabenbelastung (Gewinnsteuern, Lohnsteuern und Sozialversicherungsbeiträge als Prozentsatz der gesamten gewerblichen Gewinne gemessen an den Unternehmensgewinnen) derzeit immer noch 12 Prozentpunkte höher als in der Vergleichsgruppe (EU-6).
- In den EU-28 Ländern ist neben der Senkung der Körperschaftssteuer eine klare Tendenz zum Ausbau der steuerlichen F&E-Förderung zu beobachten (19 Einzelmaßnahmen zwischen 2010 und 2015). Auch in Österreich wurde die indirekte F&E-Förderung mit Beginn des Jahres 2016 weiter ausgebaut.
- Eine Vielzahl von OECD-Ländern haben zwischen 2000 und 2015 ein Patent/IP Box Steuersystem eingeführt (Steuersonderregelung für Erträge

aus Investitionen in Patente oder geistiges Eigentum). Vor kurzem haben Großbritannien (2013), Portugal (2014), Italien (2015) und Irland (2016 Wiedereinführung) eine Patent/IP-Box eingeführt. In Deutschland sind derartige Pläne bis zum endgültigen Ergebnis der OECD-BEPS Konsultationen verschoben worden. Auch die Vereinigten Staaten haben Pläne ein solches IP-Steuersystem einzuführen. Patent/IP-Box Regime unterscheiden sich in den einzelnen Ländern in Bezug auf die Erfassung der verschiedenen Arten von geistigem Eigentum und bezüglich der Höhe des reduzierten Steuersatzes. Die Steuerregelungen gelten in den meisten Ländern unabhängig von der Größe des Unternehmens. Ausnahme ist Südkorea mit einem Schwerpunkt auf KMUs.

- Das Hauptargument für die Einführung eines Patent/IP-Box ist, dass zusätzliche Anreize für Innovationen geschaffen werden. Gleichzeitig wird der Standort attraktiver für multinationale Unternehmen und für ausländische Direktinvestitionen. Die Patent/IP-Box wird neben den F&E-Subventionen als ergänzende Maßnahme zur F&E- und Innovationsförderung betrachtet. Der Steuerausfall durch die Einführung der Patent/IP Box hängt von Höhe der Senkung des Körperschaftssteuersatzes und Definition der Bemessungsgrundlage ab. Da mehr Firmen in geistiges Eigentum investieren als in F&E-Aktivitäten ist die Steuerbemessungsgrundlage entsprechend höher.
- Die Patent/IP-Box wird von Politikern und Wissenschaftlern kritisch gesehen, weil sie von multinationalen Unternehmen verwendet werden, Steuern zu minimieren. Diese besonderen Steuerregelungen untergraben die Bemühungen der EU eine gemeinsame konsolidierte Körperschaftsteuer-Bemessungsgrundlage (GKKB) zu schaffen. Ein weiterer Nachteil des Patents/IP-Box-Regime ist, dass es nationale Versuche untergräbt die Steuerbasis zu erweitern und im Gegenzug erschwert die Steuerlast insgesamt zu senken. Zudem führt die Einführung einer Patent/IP Box zu hohen administrativen Kosten (Steuerprüfungen).

- Die OECD hat Leitlinien (Aktionsplan Basis Erosion und Gewinnverlagerungen ", BEPS) für die Ausgestaltung der Patent IP-Box entwickelt. Die Patent/IP-Box in den großen und mittleren EU-Ländern (UK, BE, ES, NL) folgen weitgehend OECD-Richtlinien (spezielle Steuersätze für Einkünfte aus Patenten sind nur erlaubt wenn Patente/IP-Aktivitäten durch heimische F&E-Aktivitäten generiert werden). Dies ist nicht der Fall für die Patentboxen in der Schweiz (Nidwalden), Zypern und Malta.
- Österreich steht vor einem erhöhten internationalen Steuerwettbewerb für Produktions- und Investitionsaktivitäten in geistiges Eigentum. Durch die Einführung der Patent/IP Box in den Nachbarländern (CH, IT, HU) wird der Druck eine Variante eines Patents /IP-Box einzuführen zunehmen. Österreichs Wirtschaft wird von großen ausländischen Tochtergesellschaften und regionalen Headquarter-Firmen dominiert. Für diese Unternehmen ist es leicht, ihr geistiges Eigentum in Länder mit einem niedrigen Steuersatz für diese Aktivitäten zu verlagern.

Beitrag der Investitionen zur Wertschöpfung

- In Österreich beträgt der Wachstumsbeitrag des Anlagevermögens im Zeitraum 2010-2014 im Durchschnitt 0,5 Prozentpunkte pro Jahr. Dabei entfallen auf Arbeitsstunden und Produktivitätswachstum je 0,3 Prozentpunkte. Dies zeigt, dass die kumulierten Investitionen einen höheren Wachstumsbeitrag liefern als der Beitrag des Faktors Arbeit. In der Sachgütererzeugung ist der Wachstumsbeitrag des Kapitalstocks mit 1,1 Prozentpunkten pro Jahr höher als in der Gesamtwirtschaft.
- Investitionen in geistiges Eigentum liefern den Hauptbeitrag zum Wachstum der realen Wertschöpfung. Unterschieden nach Kapitalarten zeigt sich, dass der Wachstumsbeitrag des Anlagevermögens in geistiges Eigentum mit 0,3 Prozentpunkten höher ausfällt als für das Anlagevermögen in Maschinen und Ausrüstungen oder Bauten (je 0,1 Prozentpunkte). In der Sachgütererzeugung ist der Wachstumsbeitrag von Investitionen in geistiges Eigentum mit 0,8 Prozentpunkten am höchsten.

Insgesamt hat der Beitrag des Anlagevermögens in geistiges Eigentum zur realen Wertschöpfung seit 2005 zugenommen.

Bestimmungsfaktoren der Investitionen

- Auf Basis von Länderdaten für die Industrieländer lässt sich kein statistischer Zusammenhang zwischen dem Anteil der Ausrüstungsinvestitionen und Geschäftsklimafaktoren nachweisen.
- Der Anteil der Investitionen in geistiges Eigentum geht Hand in Hand mit der Höhe der Gewährleistung des Anlegerschutzes, dem Anteil der F & E-Subventionen, dem Ausmaß der Managerhaftung und dem BIP pro Kopf.
- Länder mit einem hohen BIP pro Kopf haben einen überproportional hohen Investitionsanteil von geistigem Eigentum. Als Beispiele sind hier die Schweiz, Vereinigte Staaten und Schweden genannt.
- Die ökonometrische Analyse auf Basis von Sektordaten für eine Gruppe von fortgeschrittenen EU-Ländern zeigt, dass der effektive Durchschnittssteuersatz (EATR) einen signifikanten und positiven Einfluss auf die Investitionen hat. Im Durchschnitt führt eine Reduzierung der EATR um einen Prozentpunkt zu einer Steigerung des Kapitalstocks um 0,5% in der Sachgütererzeugung 1,1% in den produktionsnahen Dienstleistungen.
- Eine Senkung der effektiven durchschnittlichen Körperschaftsteuersätze von 23 bis 21% (und damit auf das Niveau der EU-6-Länder welche eine ähnliche Größe und BIP pro Kopf aufweisen) würde zusätzliche Investitionen von rund 120 Millionen Euro in der Sachgütererzeugung und 470 Millionen in den produktionsnahen Dienstleistungen generieren. Der Investitionszuwachs dürfte damit höher ausfallen als die entgangenen Steuereinnahmen welche vorsichtig auf 130 Millionen geschätzt werden.
- Im Gegensatz dazu hat die Senkung der langfristigen Zinsen keine stimulierende Wirkung auf die Investitionen. Die fortschreitende Digitalisierung gemessen als Anteil der Beschäftige mit Internet-Breitband Anschluss stimuliert teilweise das Wachstum des Kapitalstocks.

- Unternehmenssteuersätze haben nicht nur einen Einfluß auf die Investitionen im Inland, sondern auch auf die ausländischen Direktinvestitionen. Die empirische Analyse zeigt, dass ausländische Direktinvestitionen und Faktorkosten (Unternehmenssteuern und Lohnstücken) in einem negativen Zusammenhang stehen. Da Österreichs Wirtschaft durch einen hohen Anteil von multinationalen Unternehmen geprägt ist, würde eine Senkung der Unternehmenssteuern zusätzliche ausländische Direktinvestitionen nach sich ziehen.
- Hinsichtlich der Wirksamkeit der bisherigen Investitionsfördermaßnahmen gibt es keine gesicherten Ergebnisse. Es gibt einige Hinweise, dass die Einführung der vorzeitigen Abschreibung vor allem den Unternehmen in der Sachgütererzeugung zu Gute kam. Von der 10%igen Investitionszuwachsprämie haben vor allem Unternehmen in den unternehmensbezogenen Dienstleistungen profitiert. Doch beide Maßnahmen sind bei den Entscheidungsträgern in den EU-Ländern derzeit nicht sonderlich gefragt und werden in erster Linie als temporäre Maßnahmen eingesetzt um Investitionen zu stimulieren.
- Eine Firmendatenanalyse für Österreich zeigt, dass Investitionen in geistiges Eigentum (hier definiert als Investitionen in Ausbildung, Software, Forschung und Entwicklung, Design und Branding) von der Unternehmensgröße abhängen. Junge Unternehmen, Produktinnovatoren und wissensintensiven Dienstleistungen (Informations- und Kommunikationsdienste) investieren am meisten in geistiges Eigentum.
- Erste Ergebnisse über die Wirksamkeit des Patents/IP-Box sind nicht eindeutig. Von den fünf EU-Ländern (BE, ES, NL, MT und LU), welche die Patent/IP-Box zwischen 2007 und 2010 eingeführt haben, ist nur für Malta, Spanien und Belgien ein Anstieg des Anteils der Investitionen in geistiges Eigentum in Relation zum BIP zu beobachten (im Vergleich zu den Ländern welche keine Patent/IP-Box eingeführt haben). Malta verzeichnet einen Zuwachs in Höhe von einem Prozentpunkt, gefolgt von Belgien mit 0,6

Prozentpunkten und Spanien mit 0,5 Prozentpunkten nach der Einführung. Die Einführung des Patent/IP Box in den Niederlanden und in Luxemburg hat sich nicht in einer Erhöhung des IPP-Investitionsanteils niedergeschlagen. Neuere Studien zeigen ebenfalls nicht eindeutige Ergebnisse zur Wirksamkeit des Patents/IP-Box Regimes. Alstadsæter, et al. (2015) kommen zu dem Ergebnis, dass die Einführung eines Patents/IP-Box zu einer regionalen Verlagerung von Patenten führt und nicht von einer Zunahme der lokalen Erfinder oder inländische F&E-Aktivitäten begleitet wird. Die Autoren kommen zur Schlussfolgerung, dass die Patent-Box hauptsächlich dazu verwendet wird Unternehmenssteuern zu sparen.

- Ein weiteres Argument für die Umsetzung des Patent/IP-Box ist die erhöhte Attraktivität für ausländische Direktinvestitionen in immaterielle Vermögenswerte. In der digitalisierten Welt können Erträge auf geistiges Eigentum leicht in Niedrigsteuer-Länder verschoben werden. Empirische Daten zeigen, dass Länder, die entweder in 2007 oder 2008 ein Patent/IP-Box eingeführt haben (Belgien, China, Luxemburg, Niederlande, Spanien) keine Zunahme der Direktinvestitionen in Forschung und Entwicklung, Konstruktion und Testaktivitäten erzielen konnten. Einzige Ausnahme ist die Niederlande, welche eine deutliche Zunahme der Direktinvestitionsprojekte in Forschung und Entwicklung, Konstruktion und Testverfahren erzielen konnte. Eine mögliche Erklärung ist, dass das IP-Box Regime in den Niederlanden großzügiger und umfassender ist als in anderen Länder und 2010 reformiert wurde.

Maßnahmen zur Steigerung der Investitionen

- Der Verbesserung des Investitions- und Geschäftsklima-Faktoren sollte **erste Priorität** eingeräumt werden. Es gibt Fortschritte in einigen Bereichen (deutliche Reduzierung der Kosten für die Unternehmensgründung), jedoch Verschlechterung in anderen Bereichen (Gewährleistung des Anlegerschutzes, Kosten der Durchsetzung von Verträgen). Trotz der jüngsten Reformen ist die Gesamtbelastung an Steuern (Lohnsteuern und

Sozialabgaben sowie sonstige Steuern abzüglich zulässige Abzüge und Ausnahmen) deutlich höher als in anderen fortgeschrittenen EU- Länder mit ähnlicher Größe und BIP pro Kopf (+12 Prozentpunkte Differenz). Eine Verbesserung dieser Investitionsklima-Faktoren würde Österreich auch attraktiver für ausländische Direktinvestitionen machen. Lohnstückkosten und Unternehmenssteuern sind wichtige Determinanten von ausländischen Direktinvestitionen.

- Direkte Investitionszuschüsse sind in erster Linie auf kleine Unternehmen, Kleinst- und junge Unternehmen oder Unternehmen in weniger entwickelten Gebieten ausgerichtet. Die Investitionsförderung hat auch eine wichtige Funktion den Strukturwandel voranzutreiben. In den letzten Jahren sind die Investitionszuschüsse der AWS (definiert als der Barwert der Investitionszuschüsse gemessen an den privaten Unternehmens-investitionen) deutlich zurückgegangen und befinden sich auf einem historisch niedrigen Niveau (1,3 % der privaten Investitionen im Vergleich zu 2,6 % vor der Wirtschafts- und Finanzkrise). Zusätzliche öffentliche Mittel von etwa 100 Millionen Euro pro Jahr wären erforderlich, um die Höhe der Investitionszuschüsse vor der Wirtschafts- und Finanzkrise im Jahr 2008 zu erreichen. Die Anhebung der Investitionszuschüsse auf das Niveau vor der Krise sollte die **zweite Priorität** haben.
- Bestehende Instrumente (Investitionssteuergutschriften, großzügigere Abschreibungsmöglichkeiten, Senkung der Unternehmenssteuern) haben Vor- und Nachteile. KMUs und Start-ups welche keine steuerpflichtigen Gewinne aufweisen profitieren nicht von Steuergutschriften. Steuergutschriften für Investitionsausgaben sind nur sinnvoll wenn kurzlebige Investitionsgüter und Transportfahrzeuge ausgenommen werden. In Österreich scheint die vorzeitige Abschreibung zwischen 2009 und 2010 effektiver gewesen zu sein als die Investitionszuwachsprämie zwischen 2002 bis 2004. Die vorzeitige Abschreibung hat sich damit als

vorübergehende Investitionsfördermaßnahme in konjunkturellen Abschwungphasen bewährt.

- Da sich die Struktur der Investitionen in Richtung immaterieller Vermögenswerte verschiebt, sind unterschiedliche Instrumente und Maßnahmen für die verschiedenen Typen von Investitionen erforderlich. Als **dritte Priorität** ist die Entwicklung eines Aktionsplans zur Steigerung der Investitionen in geistiges Eigentum vorzusehen. Die Investitionen in geistiges Eigentum werden in allen Branchen getätigt, im Gegensatz zu F&E-Aktivitäten, welche auf wenige Branchen konzentriert werden. Maßnahmen zur Steigerung der IP-Investitionen würde eine Vielzahl von Unternehmen erreichen und ist nicht auf eine kleine Anzahl von F&E-intensiven Branchen beschränkt. Erste Schätzungen zeigen, dass eine Erhöhung der Investitionen in geistiges Eigentum auf das Niveau der führenden europäischen Länder zu einem Anstieg des realen BIP-Wachstums von 0,3 Prozentpunkten führen würde. Die Einführung eines Patent/IP-Box ist nicht ausreichend, um dieses Ziel zu erreichen. Eine umfassende Strategie ist erforderlich, dass Österreich seine Position als attraktiver Standort für geistiges Eigentum behauptet bzw. ausbaut.
- Die Entwicklung eines "Österreichischen Patent/IP Box“ Plans könnte Teil einer Investitionsförderung sein und ist die **vierte Priorität**. Dieser Plan sollte für entsprechende Umsetzung und Ratifizierung verfügbar sein. Eine Abstimmung mit innovationspolitischen Maßnahmen (steuerliche F&E-Förderung) ist hier jedoch erforderlich. Rasches Handeln ist erforderlich, wenn die übrigen technologisch führenden Länder der Welt (zum Beispiel US, DE und SE) entscheiden, ein solches Regime einzuführen. Eine entsprechende Ausgestaltung des Patent/IP-Box Regimes könnte österreichische Unternehmen und ausländische Töchter ermutigen, mehr F&E bzw. in anderen verwandte Aktivitäten in österreichische Standorte zu investieren statt im Ausland. Der Plan sollte eine Schätzung einer Kosten-

Nutzen-Analyse enthalten (Steuerausfall bzw. mögliche positive Auswirkungen).

- Eine österreichische Patent / IP-Box Steuerregelung Plan sollte den Richtlinien des modifizierten OECD-Nexus-Ansatz folgen. Der Plan sollte Angaben über die Art des geistigen Eigentums enthalten und die Höhe des reduzierten Steuersatzes. Eine breite Definition von IP einschließlich Software, Datenbanken, Business-Know-how, Urheberrechte und Design sollten wegen möglicher positiver Spillover-Effekte auf andere Unternehmen in Betracht gezogen werden. Die Einführung einer solchen Maßnahme kann als ein Schritt der Umsetzung der EU-2020-Strategie gesehen werden. Eine breite Definition von IP würde indirekt auch Innovationsanreize für die "Creative Industries" bieten. Die Beschränkung des Patents/IP-Box auf Erträge von Patenten ist bei weitem zu restriktiv. Ein ermäßigter Steuersatz sollte nur dann gewährt werden, wenn die zugrunde liegenden Innovationen durch inländische F&E-Aktivitäten generiert werden.
- Die **fünfte Priorität** ist die Unterstützung bzw. Förderung von anderen Produktionsfaktoren welche von steigenden Investitionen in geistiges Eigentum profitieren. Insbesondere ist Mehrbedarf von Ingenieuren, Naturwissenschaftlern und Technikern zu erwarten. Somit ist die Bildungspolitik gefragt mehr und bessere Hochschulabsolventen in diesem Bereich bereitstellen.
- Als **sechste** Priorität gilt es die zu erwartende Kluft bei den effektiven durchschnittlichen Unternehmenssteuern im Vergleich zu anderen fortgeschrittenen europäischen Ländern zu schließen.
- Investitionsfördermaßnahmen sollten mit wissenschaftlichen Methoden evaluiert werden. Bisher ist wenig über die Wirksamkeit der bisherigen Investitionsfördermaßnahmen bekannt. Dies gilt vor allem für Österreich aber auch für andere EU-Länder. Hierzu ist ein Zugang zu den Firmendaten der amtlichen Statistik notwendig.

Executive summary (long):

Stylized facts on patterns of investment in the advanced countries

- In Austria the ratio of investment in machinery, equipment and intellectual property products (IPP) to GDP is about 12 per cent, and has been stable from 2008 onwards. The decline in the ratio of investment in machinery, equipment and IPP during and after the economic and financial crisis was less pronounced in Austria than in other EU countries with similar population size and GDP per capita. The introduction of the bonus/accelerated depreciation regime in 2009/2010 has contributed to the favourable development of equipment investment, particularly in manufacturing.
- The share of investment in machinery, equipment and IPP is slightly higher in Austria than the group of EU-6 countries (BE, DK, FI, IR, NL and SE) with similar size and GDP per capita (with a difference of one percentage point). The higher ratio of machinery and equipment investment to GDP in Austria as compared to these EU-countries reflects differences in economic structure with a dominance of capital intensive industries but do not reflect a higher share in investment in intangible assets.
- When looking at the share of investment in machinery and equipment only (excluding investment in IPP), there is a decline in the investment ratio from 2008 onwards. The decline in the machinery and equipment investment ratio can be observed in all industrialised countries including the most technologically advanced countries (Korea, Switzerland) and the less advanced EU countries.
- In the advanced industrialised countries the structure of investment is highly heterogeneous with respect to asset type with the structure of investment changing away from structures and equipment towards intellectual property products (IPP) (software, databases, R&D, mineral exploration, entertainment, literary or artistic originals and other IPP). In

Austria the share investment in IPP in total investment is highest in manufacturing (47 per cent), information and communication services (56 per cent), and financial services (47 per cent) between 2010 and 2014 on average based on national accounts data.

- In Austria in recent years the share of IPP investment in total investment has increased in the majority of industries. The strongest increase can be observed in manufacturing (+6 percentage points), information and communication services (+12 percentage points), professional and technical services (+5 percentage points), construction (+8 percentage points), and wholesale and retail trade (+3 percentage points) (based on comparison before and after the economic and financial crises, i.e. 2010 to 2014 in comparison to 2005 to 2008).
- In Austria there is a gap in the ratio of IPP investment to GDP as compared to the EU-6 countries (BE, DK, FI, NL, IE and SE) (4.5 vs. 4.9 per cent in 2014 equal to a difference of 0.4 percentage points) and particularly to the most advanced countries (USA, South Korea and Switzerland with an IPP investment share ranging between 5 and 6 per cent). Austria has slightly reduced the gap in the IPP investment share from 2005 onwards. This is mainly due to higher investments in R&D.
- Capital stock increased at moderate levels similar to real value added growth, indicating constant capital productivity. As expected, evolution of the capital stock is highly heterogeneous with respect to asset type. While fixed assets in intellectual property products (in constant prices) increased by 6 per cent per year on average between 2005 and 2014, fixed assets in structures and machinery and equipment increased only slightly (with a growth rate of 0.5 and 1 per cent per year on average, respectively).

Stylized facts on trends in investment determinants, and investment and business climate factors

- Investment is determined by a complex set of factors including the price of new investment, interest rates, depreciation rates and depreciation regime, tax treatment of capital, expected output and profits, access to (bank) finance, direct investment grants and general investment and business climate factors.
- The amount of public investment grants in Scandinavian countries, Belgium, Ireland and the Netherlands are more than four times higher than in Austria, In Switzerland the relation is ten times. In Austria, public investment grants for companies in terms of GDP declined by more than 70 per cent (from 0.2 per cent to 0.07 per cent) as compared to the period before the financial and economic crisis more than in any other EU country in Austria with similar economic performance and size.
- Data based on the largest Austrian public investment bank shows a similar picture: The net present value of the investment support for companies is slightly more than half as compared to the period before the economic and financial crisis.
- Austria's depreciation method falls in the straight-line depreciation regime which belongs to a group of less generous European depreciation regimes. The majority of advanced European countries (BE, CH, DK, LU, SE, FI and UK) offer different choices for deprecation regimes (declining balance, accelerated depreciation, declining or pooled mixed solutions).
- Austria did not undertake investment stimulating measures between 2010 and 2015 on a net basis. In particular, there are three investment stimulating measures and three investment discouraging measures. Investment stimulating measures include (i) an increase in tax allowance for unincorporated businesses, (ii) removal of the loss carry-forward limit of 75 per cent, and (iii) increase of the Research and Development tax credit from 10 to 12 per cent. Investment discouraging measures include (i) deductibility for losses made in

foreign subsidiaries being restricted in group taxation, (ii) abolition of the education premium and education tax allowance and limitation of refunding of contributions, and (iii) extension of non-deductibility of certain interest and royalty payments.

- In the EU-countries reduction of corporate tax rates (24 individual measures between 2010 and 2015 on an annual basis) clearly dominates over traditional investment policy measures (accelerated depreciation regimes, investment tax credits). Introduction of bonus depreciation or investment tax credits is in most cases a temporary rather than permanent measure.
- In EU countries with similar population and GDP per capita (EU-6) the effective average tax rate (EATR) decreased from 24 to 21 per cent between 2005 and 2014 whereas Austria's EATR has been stable at about 23 per cent in the same period. At present Austria's EATR is 2 percentage points higher than in EU-countries with similar size and economic development. This gap in the EATR will increase in the coming years since several countries in this group announced further CTR cuts and thereby also EATR cuts. The rising tax gap will place pressure on policymakers to adjust corporate tax rates to the level of this country group. Empirical results show that there is a strong relationship between the corporate tax rate and both domestic investment and foreign direct investment. This also holds true for the highly developed EU countries.
- Most corporate tax reform measures do not have an exclusive SME focus. Measures directly targeting subgroups of firms (young firms, start-ups, micro enterprises or small firms) are rare exemptions. Only eight measures in the EU-28 between 2010 and 2015 address SMEs exclusively. Preferential tax treatment of SMEs should be considered critical because they can discourage their growth when small business owners

try to keep reported revenues, income or employment below certain thresholds to take advantage of special tax treatment.

- Access to finance has improved over the last years. Long term Interest rates have declined to a historically low level (with a loan interest rate of 1.6 per cent). However, such long term interest rates are becoming less and less relevant in the investment decision.
- Access to bank finance is no longer a problem for Austrian firms. The percentage of firms who regard bank lending as restrictive has steadily declined from 2011 onwards (from 47 per cent to 37 per cent).
- In Austria, business and investment climate factors have developed highly uneven over time. While there is has been a strong decline in the costs of starting a business, other business climate factors have increased over the last years (e.g. costs of enforcement of contracts, strength of legal rights for getting credit). The deterioration of these business climate factors is more pronounced in Austria than in the group of comparable EU countries. Progress can be also observed with respect to the total tax rate. However, the total tax rate (profit taxes, labour taxes and social security contributions as a percentage of total commercial profits) is still 12 percentage points higher than in the comparison group (EU-6).
- In the EU countries there is a clear tendency to support innovation activities. Expansion of R&D tax incentives is the second most popular measure besides changes in corporate taxation (19 individual measures between 2010 and 2015).
- More than 16 OECD countries introduced a Patent Box tax regime (special tax regime for income generated from investment in patents or Intellectual Property) between 2000 and 2015. It is also known as or intellectual property (IP) Box, innovation-box or knowledge box. Recently the UK (2013), Portugal (2014), Italy (2015) and Ireland (2016 reintroduction) introduced a patent/IP box. Germany's plan to

introduce a similar regime in 2014 was blocked by the Federal States and delayed until the final outcome of the OECD BEPS project. The United States has plans to introduce such an IP tax regime. The German and U.S. IP box will be designed in a similar way as the Irish and Italian IP box regimes, both of which have introduced a "knowledge development box". Patent/IP box regimes differ highly across countries with respect to the coverage of different types of intellectual property eligible for the tax reduction and the qualifying IP income. The tax regimes introduced so far generally apply to all firms except for South Korea with a focus on SMEs.

- The main argument for the introduction of a patent/IP box regime is to increase incentive for innovation output, and to increase corporate tax revenues by preventing the tax avoidance of multinational enterprises which tend to shift their income from IP to destinations with a patent/IP box regime. An introduction of a variant of the patent/IP box can reverse the trend of firms relocating intellectual property to countries with a patent/IP box regime. The IP box likely affects innovation output and is thus a complementary measure to supporting innovation input via direct and indirect R&D subsidies. An IP box can provide incentives to commercialize a country's IP, leading to the creation of new products and services. The tax saving for firms caused a patent/IP box regime is dependent on the definition of coverage of different types of IP and the reduced tax rate. However, in most instances tax relief is much higher in the case of patent/IP box regime than that of R&D tax incentives. This is related to the fact that much more firms are investing in IP, and the amount of investments in IP is much higher than that of R&D investment.
- IP and patent boxes have been heavily criticized by policymakers and academics because they are used by multinational enterprises to minimize taxes. These special tax regimes undermine the EU's effort to

create a common consolidated corporate tax base (CCCTB) and attempts to avoid intellectual property related profit shifting. It is well known that a number of US multinationals have transferred their IP to an IP-Holding company in an EU country that offers a special IP Box Regime. This practice has been called the "Double Irish Dutch Sandwich". Another disadvantage of the patent/IP box regime is that it undermines national attempts to broaden the tax base and lower general taxes. Also the patent box would lead to higher costs for the tax administration with increasing complexity and higher monitoring costs.

- The OECD has developed guidelines (action plan Base Erosion and Profit Shifting", BEPS) for the configuration of patent/IP boxes. The patent/IP boxes in the large and medium sized EU countries (UK, BE, ES, NL) largely follow OECD guidelines (special tax rates for income from patents/IP should be only allowed when patents/IP is invested using domestic R&D capacities). This is not the case for the patent boxes in Switzerland Nidwalden, Cyprus and Malta.
- Austria is facing increased tax competition for location of intellectual property from neighbouring countries (CH, IT and HU). Pressure to introduce a variant of the patent/IP box regime will increase. Austria's economy is dominated by large foreign subsidiaries and regional headquarter firms that can easily shift their intellectual property to low tax EU countries.

Contribution of investment to value added growth

- In Austria for the period 2010 to 2014 the contribution of capital to real value added growth is about 0.5 percentage points per year on average. Labour input accounts for 0.3 percentage points and the residual (total factor productivity) accounts for 0.3 percentage points. This indicates that capital is the most important production factor.

- The contribution of capital accumulation to real value added growth is most important in manufacturing with 1.1 percentage points per year.
- When distinguished by type of asset the findings show that capital stock related to intellectual property products investment account for 0.3 percentage points (p.p.), equipment for 0.1 p.p. and structure for 0.1 p.p.
- The highest contribution of IPP capital can be observed in manufacturing with +0.8 p.p. per year on average. In contrast the contribution of equipment capital is about +0.2 p.p.
- It is important to note that the contribution of capital related to intangible property products has increased since 2005.

Analysis of the drivers of investment

- Evidence at the country level for the industrialized countries shows that in most cases investment or business climate factors are not relevant for the equipment investment share.
- Share of IPP investment at the country level is significantly positively related to strength of investor protection, level of R&D subsidies, extent of director liability and GDP per capita.
- Countries with a high GDP per capita invest a disproportionately high share in intellectual property products (with Switzerland, the United States and Sweden investing more than 5 per cent of GDP in intangible property products).
- Econometric analysis for a group of advanced EU countries at the industry level shows that both the effective average tax rate (EATR) and the corporate tax rate are significant drivers of investment. On average a 1 percentage point reduction in the EATR leads to an increase in the growth of the capital stock by 0.5 per cent in manufacturing, and a 1.1 per cent increase in producer services.
- Given the estimated corporate tax elasticities, one can calculate the possible effects on investment in Austria if a decrease in the effective

average corporate tax rate to the level of the EU-6 countries were to take place (decrease in the EATR rate from 23 to 21 per cent). A decrease in the EATR rate to that of countries with a similar size and GDP per capita (equal to reduction) would generate additional investment of about EUR 120 million in manufacturing and 470 million in producer services. The gains are much higher than the possible reduction in the amount of corporate taxes which is estimated to be about 130 million.

- In contrast reduction in long term interest rates has no stimulating effect on growth of capital stock. Digitalization partly stimulates growth of capital stock.
- Corporate tax rates not only affect domestic investment but also foreign direct investment. Empirical analysis shows that foreign direct investment is significantly negatively related with the level of corporate taxes and unit labour costs. Since Austria's economy is characterised by a high share of production and R&D activities performed by multinationals, lowering corporate taxes would increase foreign direct investment.
- Little is known about the effectiveness of past investment support measures. There is some evidence that introduction of the bonus depreciation regime has mainly benefitted manufacturing firms, while the incremental investment tax credit (Investitionszuwachsprämie) has primarily stimulated investment in business services firms. However, both the bonus depreciation regime and the Investment tax credit are no longer popular among European policy makers and are primarily used as temporary measures to stimulate investment.
- Firm level analysis shows that IPP investment (here defined as training, software, R&D, design, company reputation and branding) is significantly positively related to firm size, higher for young firms (partly)

and product innovations, and highest in knowledge intensive services (information and communication services)

- The gap in the share of investment in IPP to that of the similar EU countries calls for measures to stimulate investment in IPP. Firm level evidence for Austria shows that investment in IPP leads to increased output and market share. More importantly, the skills and qualifications of employees benefit from these investments indicating that both intangible assets are complementary input factors to skilled employees. An argument against the introduction of a patent box/IP box is that in Austria the level of direct and indirect support for R&D is already very high as compared to similar countries. Note that South Korea, which exhibits the most generous system of R&D tax incentives and direct R&D subsidies in the world, introduced such an IP box in 2011 (restricted to SMEs).
- Firm level analysis shows that EU-Countries (BE, ES, FR, HU, LU, MT and NL) that introduced the reduced CTR for IP related income between 2000 and 2010 do not exhibit higher investments in different types of intangible assets than countries that have not introduced the reduced patent or IP box. However, given the small sample size it is too early to draw strong conclusions about the effectiveness of reduced CTR for IPR related income at the firm level.
- Preliminary findings on the effectiveness of the patent/IP box tax regime are mixed. Of the five EU countries (BE, ES, NL, MT and LU) that introduced the patent box tax regime between 2007 and 2010, only Malta, Spain and Belgium experienced a faster than average growth in the share of investment in intellectual property products to GDP as compared to countries not introducing the patent/IP box. Malta experienced a growth in the IPP investment share of 1 percentage point, followed by Belgium with +0.6 percentage points and Spain with 0.5 percentage points after introductions. The introduction of the

patent box in the Netherlands and Luxembourg has not lead to an increase in the IPP investment share. The findings are consistent with those obtained on firm level data on IPP usage. Recent studies also show ambiguous results on the effectiveness of the patent/IP box regime. Alstadsæter, et al. (2015) find that the introduction of a patent/IP box regime leads to a shift in the location of patents without a change in the number of local inventors and domestic R&D activities. The authors find that the patent box is mainly used to save corporate taxes.

- Another argument for implementation of patent/IP boxes or patent boxes is the increased attractiveness for foreign direct investment in intangible assets. In the digitalized world, intellectual property and the income derived from IP can be easily shifted to low tax destinations. Empirical evidence shows that countries that introduced a patent/IP box regime between in either 2007 or 2008 (Belgium, China, Luxembourg, Netherlands, Spain) could not achieve higher inflow in R&D, design and testing activities. The only exception is the Netherlands who experienced an increase in the number of FDI projects in R&D, design, testing and related activities by almost 300 (!) per cent to that of the pre reform period. A possible explanation is that the Netherlands modified the IP box regime with a broader definition of IP in 2010. Similarly, the attractiveness for FDI in headquarter functions has not increased after the introduction of the patent box regime.

Developing an investment support plan

- Improving investment and business climate factors should be first priority. There is progress in some areas (reduction of entry costs); however, there is deterioration in other areas of business regulations (strength of investor protection, costs of enforcement of contracts). Despite recent reforms the general level of taxes (labour taxes plus social security contributions plus other taxes minus allowable

deductions and exemptions) is significantly higher than that of other advanced EU countries with similar size and GDP per capita (12 percentage points when expressed as a share of commercial profits). Improving business climate factors would make Austria more attractive for foreign direct investment. Unit labour costs, corporate taxes and the general tax level are significant drivers of Greenfield foreign direct investment in advanced EU/OECD countries.

- Direct investment subsidies are primarily targeted at small firms, microenterprises and young firms or firms in less developed areas in Austria. These investment subsidies are important to foster structural change. In recent years the direct investment subsidy level (defined as the net present value of investment subsidies to private corporate investment) has declined significantly and reached historically low levels (1.3 per cent of private investment as compared to 2.6 per cent before the economic and financial crisis). Public funds of about EUR 100 million would be needed to reach the level of investment subsidies before the economic and financial crisis in 2008. Providing the necessary the funds should be the **second priority**.
- Existing instruments (investment tax credits, more generous depreciation allowances, reductions in corporate taxes) have advantages and disadvantages. In general SMEs and start-ups with no taxable profits do not profit from ITC and changes in the depreciation regime. Investment tax credits are often only feasible with exemptions (e.g. exclusion of transport equipment, short lived equipment) while changes in depreciation regimes are complicated. Studies attempting to evaluate the effectiveness of these measures have yielded mixed results. In Austria it seems to be that the bonus depreciation introduced between 2009 and 2010 was more successful in stimulating investment than the incremental tax credit from 2002 to 2004 ("10 prozentige Investitionszuwachsprämie"). Bonus depreciation regime should be re-

considered as a temporary investment support measure in periods with declining economic growth.

- Since the structure of investment is changing towards intangible assets, different instruments for different asset types have to be considered. Thus the **third priority** is developing an action plan to increase investment in intellectual property products. Investment in IP can be found in all industries, unlike R&D activities which are mainly conducted by manufacturing. A strategy to raise IP investment would be beneficial for a large number of firms and is not limited to a small sample of R&D doing firms. Thus intellectual property products exhibit a general purpose character as ICT. Preliminary estimates show that an increase in investment in IPP to that of the leading European countries would induce an increase in real GDP growth by 0.3 percentage points. The introduction of a patent/IP box is unlikely to be sufficient to achieve this goal. A comprehensive strategy is needed to strengthen Austria's position as an attractive location for intellectual property.
- Developing an "Austrian patent/IP/knowledge box tax regime" plan should be part of the investment support plan and should be the **fourth priority**. This plan should be ready for implementation and ratification when needed. Coordination with innovation policy measures is necessary. Urgent action is required when the remaining innovation leaders in the world (e.g. US, DE and SE) decide to introduce such a regime. An appropriate design of the patent/IP box could encourage Austrian firms to invest in Austria instead of locating R&D elsewhere. The Austrian government has to take action to formulate such a plan (together with auditors and academics). The plan should include an estimate of a cost benefit analysis with an estimate of possible tax losses and possible effects.
- An Austrian patent /IP box tax regime plan should be proposed following the OECD modified nexus approach. The plan should contain

details about the type of intellectual property products and the level of the reduced tax rate. A broad definition of IP including software, databases, business know how, copyrights, designs and (secret) industrial production or fabrication processes, formulas and trademarks should be considered because of possible spillover effects to other firms. The introduction of such a regime can be regarded as an important step in implementing the EU 2020 strategy. A broad definition of IP in such an IP box regime would indirectly also provide innovation incentives for the "Creative industries". Restricting the patent/IP tax regime on patents is by far to narrow. Income from innovation output should be only eligible for tax exemption when the underlying innovations are generated by domestic R&D activities. This is difficult to monitor and maybe not consistent with EU law.

- The **fifth priority** is public support of complementary factors of IP investment. This includes measures such as an increase in the skilled labour supply, and a higher supply of engineers, natural scientists and technicians.
- The **sixth priority** should be closing the actual and expected gap in effective average corporate taxes to that of other advanced European countries.
- Investment support measures have to be evaluated using qualitative and quantitative methods. Little is known about the effectiveness of past investment support measures.

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1 Introduction

In advanced economies, private fixed investment fell sharply during the 2008 economic and financial crisis. Since then, there has been little recovery. Not only the level of investment experienced an extreme fall, but also the ratio of investments in fixed assets to GDP. There is an ongoing debate about the causes of the decline of private fixed investment. A recent study by the IMF comes to the conclusion that the main factor for weak investment is lack of demand (Aslam et al., 2015). Other factors include financial constraints, uncertainty or structural changes such as the change in the composition of investment. Overall, there is no consensus on the factors affecting the decline in investment. The decline in the investment ratio can also be observed for the Austrian economy. However, when looking at the share of investment in equipment and machinery as well as intellectual property products (IPP), we find that the investment ratio has been relatively stable since after the economic and financial crisis. This indicates that the decline in investment in machinery and equipment is one reason for the overall stagnation in investment whereas investment in intellectual property products is rising. Thus, the structure of investment is moving away from structures and equipment towards intellectual property products with a share of five per cent GDP in advanced countries.

Given the stagnation in investment, knowledge of the main factors influencing the investment decision and amount of investment is crucial. It is well known that investment is one of the key factors of economic growth. In Austria, it is often argued that investment and business climate conditions have deteriorated in recent years. In addition, it is frequently stated that the burden of taxes and the level of business regulations are too high. Recently, to the detriment of multinational companies, Austria has changed the group taxation regime to the disadvantage of firms. Further, the effective average tax rate for corporations has been unchanged since 2005 while countries with similar GDP per capita and size have lowered their corporate tax rate by

three percentage points in the same period. At the same time business regulations such as the costs of enforcement contracts have been increased.

In recent years, investment incentives have shifted away from classical investment policy measures (such as bonus depreciation, tax credit) to policy measures in the area of R&D support (additional R&D tax incentives) and intellectual property products (patent/IP box). In Austria, there is a strong focus on supported measures directed at R&D and innovation activities as well as education policies, while policies to enhance corporate investments receive little attention.

It is well known that investment is highly heterogeneous. In the national accounts, investment can be distinguished in structures, machinery and equipment as well as intangible assets. In some industries investment in intellectual property products as defined in the national accounts already accounts for almost 50 per cent of total investment. Investments in these knowledge intensive activities are essential for sustainable growth and job creation.

In industrialised countries investment is one of the most important production factors. An empirical study for Austria shows that the growth contribution of capital is significant: Between 1995 and 2004 the contribution of capital accumulation was about one percentage point per year on average (Kegels, Peneder & van der Wiel, 2012). Despite the major importance of investment and capital for economic growth, there is no comprehensive study available that investigates both the determinants of investment and their impacts. Further, no study exists that discusses appropriate policy measures to stimulate investment.

In the past, two temporary investment support measures were introduced: (i) incremental investment tax credit between 2002 and 2004 and (ii) the decelerated depreciation method for the period 2009 to 2010. In 2005 the corporate tax was lowered from 34 to 25 per cent. In 2011 and 2013 the group

taxation regime was changed to have more restrictions (limited tax deductibility of intra-group interest and royalty payments).

Knowledge of the main determinants of investments and their impacts is useful for making better decisions for future policy actions. Both investment credits and accelerated depreciation regimes reduce the price of new capital goods (user costs of capital) and thus increase the demand for investment goods. However, tax losses through these incentives should be compared with the positive effects of increased investment.

The aim of the study is a comprehensive assessment of impacts and determinants of investments. The data is based on national accounts data, industry level data and firm level data for the EU-28 countries plus selected non-EU OECD countries. We distinguish between structures, equipment and intangible investments (also referred as IPP). In particular, the following research questions are investigated:

- How have investment, investment ratio, and net fixed assets developed in Austria and in Europe between 2001 and 2014?
- Are there differences across industries (manufacturing, total services or business services) and types of investments (structure, equipment, intellectual property products)?
- What is the contribution to growth of capital stock and the different types of capital? Has the contribution to growth changed after the economic and financial crisis?
- What are the main determinants of investment demand for the group of highly industrialized countries? What role do framework conditions (e.g. investment climate factors, taxes) play in private capital formation?
- What is the impact of different investment promoting measures (e.g. incremental investment tax premium from 2002 to 2004 and special depreciation rule from 2009 to 2010)?

- What international best practice examples can be found to illustrate the optimal design of an investment policy?
- How should optimal investment policy be designed in the future, taking into account scarce public resources? What is the role of choice of different investment policies (depreciation regime, investment tax credits, changes in corporate taxation) in major industrialized economies?

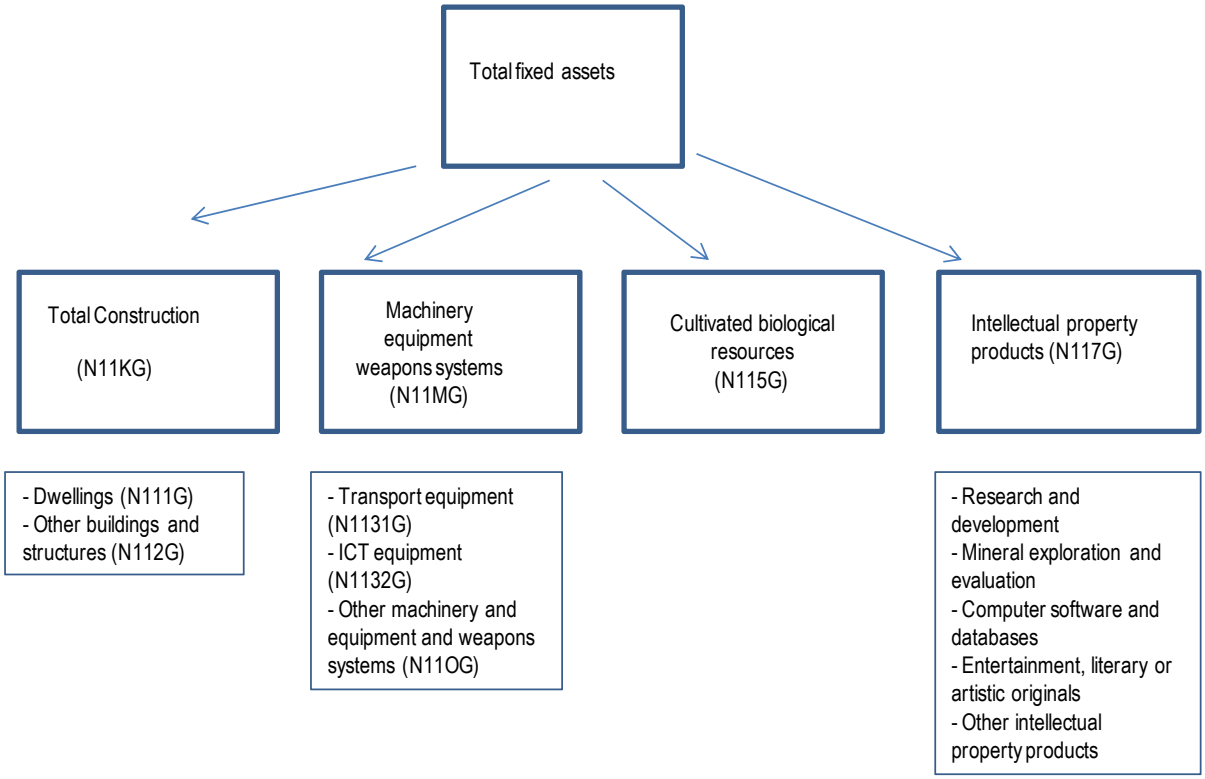
The structure of the study is as follows. Chapter two presents stylized facts and the theoretical background. Section three provides evidence on recent investment support measures in Austria compared to other EU countries. Chapter 4 provides a detailed analysis of the contribution of different types of capital to value added growth. Chapter 5 presents results on the determinants of investment behaviour at the cross-country, industry and firm level. Special focus is on the role of corporate taxes, investment climate factors, interest rates and other support measures. Chapter six provides results on the determinants of foreign direct investment. Given the results, a first attempt to develop an investment support plan is provided (chapter seven).

2 Stylized facts and theoretical background

2.1. Stylized facts

Up until 2008, in the national accounts, investment was classified into investment in structures and investment in equipment. The latter group includes intellectual property products excluding investment in R&D. With the introduction of European system of (national) accounts (ESA) in 2008, fixed investment was disaggregated into three parts: (i) structures, (ii) machinery and equipment and (iii) intellectual property products. The latter category consists of computerised information (software, databases) and innovative property (research and development, mineral exploration and evaluation, entertainment, literary or artistic originals and other intellectual property products intended for use of more than one year (see Figure 1 and Table 1).

Figure 1: Definition of investment in national accounts



Source: Own calculations based on ESA 2010 manual.

Note that intellectual property products or intangible assets are difficult to identify and define. Intangible assets are difficult to observe and to measure (Hunter, Webster and Wyatt, 2012). Intangible assets, intellectual capital and knowledge capital are often used interchangeably. In the literature, intangible assets are defined in various ways. In the economics literature, investment in intangible assets comprises computerized information (i.e. software), innovative property (scientific and non scientific R&D) and economic competencies, such as organizational capital and firm specific human capital or training (Corrado, Hulten and Sichel [CHS], 2005, 2012) (Table 1). The European Commission in their survey on intangible assets in 2013 used a similar definition: (i) training, (ii), design of products and services, (iii) company reputation and branding, (iv) organization or business process improvements, (v) R&D and (vi) software (European Commission 2013; Montresor and Vezzani, 2016). At the firm level, statements of financial accounting standards are the main data sources. The international

accounting standard (IAS 38) defines an intangible asset as an "identifiable non-monetary asset without physical substance held for use in the production or supply of goods or services" (International Accounting Standards Committee, 1998). Intangible assets can be classified as acquisition, development in the areas of scientific or technical knowledge, design, and implementation of new processes or systems, licenses, intellectual property market knowledge and trademarks (Brennan and Connel, 2000). Computer software, patents, copyrights, customer rights and marketing rights to motion picture films, licenses, franchises, models, designs and prototypes are typical examples of intangible assets. According to the international accounting standard, intangible assets do not include human resources, customer loyalty or company reputation (Brennan and Connel, 2000).

Table 1: Different definitions of intangibles assets

	National accounts ESA 2010s	OECD (1998)	CHS (2012)
Computerized information	software	software	software & computerized database
Innovative property	R&D expenditure	R&D expenditure	scientific R&D
		patents	
			new architectural & engineering designs
	entertainment, literary or artistic orginals		new product development costs in the financial industry
	mineral exploration & evaluation		entertainment, artistic & literary originals
	other IPP		mineral explorations
Economic competencies		economic competencies	
			market research, advertising expenditure
		employee training	training
			organisational capital

Aggregate data on investment in intellectual property products are partly model based. Accountants also have problems determining the value of intangible assets (Wilson and Stenson, 2008; Zéghal and Maaloul, 2011). The main reason for difficulties in measuring investment in intangible assets is a lack of consensus as to what they exactly constitute. Often only proxies are available. This holds particularly true for organizational capital, which represents the most important subgroup of intangible assets and is an

important value driving asset of the firm (Prescott and Visscher, 1980). Furthermore, in the accounting framework, valuation is based on transactions reflecting historical costs. This may be valid for the acquisition of intangible assets from other firms, but not for internally created intangible assets (Wilson and Stenson, 2008). Therefore, many internally created intangible assets are not recognized in the balance sheets (Wilson and Stenson, 2008). Based on a survey of 600 firms, Hunter et al. (2012) find that managers use rules of thumb to estimate the amount and type of intangible assets. In spite of such problems, some subcategories of intangible assets, such as R&D, advertising, software, and intellectual property (e.g. trademarks, patents and licenses) and training expenditures, can be measured quite easily.

In the economics literature, Corrado et al. (2005, 2006, 2009, 2012) introduce a broad definition of intangible assets consisting of computerized information (including software), innovative property and economic competences. The authors construct measures of investment in intangible assets for all EU countries. According to the estimates by Corrado et al. (2012), the most important subcategory of investment in intangible assets is organizational capital ranging between 12 and 36 per cent across the EU countries with an unweighted mean of 24 per cent, followed by software and R&D each with 16 per cent (unweighted across EU countries). New architectural and engineering designs, advertising and training are also important, with each constituting about 10 per cent of total investment in intangibles assets, whereas the remaining subcategories, such as entertainment, literary and artistic originals, mineral explorations, new financial products and market research only represent a tiny proportion.

Table 2 gives an overview of the ratio of investment by type in terms of GDP and total investment. In Austria, the share of investment in machinery and equipment and intellectual property products is 0.5 percentage higher than in the group of countries with similar level of GDP per capita (11.7 per cent versus 11.2 per cent on average during 2010-2014). However, there are

significant differences by type of investment between Austria and the group of comparable EU countries. While Austria spend a higher share of machinery and equipment relative to GDP (7.4 per cent versus 6.2 per cent for the period 2010-2014), the share of investment in intangible property products to GDP is 0.7 percentage points lower than the group of EU countries with similar GDP per capita (4.3 per cent versus 5 per cent). The corresponding share for other advanced industrialized countries with a similar level of GDP per capita (Denmark, Ireland, South Korea, Switzerland, the United States and Sweden) ranges between five and 6.5 per cent. Similarly, In Austria the share of IPP investment in total investment is 19 per cent, whereas in the EU-6 countries the share is 25 per cent which is equal to 6 percentage points difference.

Table 2: Proportion of investment by type (% total investment or % GDP

	Type of investment in per cent					
	Structures		Equipment and machinery		Intangible property products	
	2005-2008	2010-2014	2005-2008	2010-2014	2005-2008	2010-2014
Austria	50	48	34	33	17	19
EU-6[a]	51	46	30	30	19	25
EU-28 + NO	54	51	33	34	13	16
	Share of investment in GDP in per cent					
	Structures		Equipment and machinery		Intangible property products	
	2005-2008	2010-2014	2005-2008	2010-2014	2005-2008	2010-2014
Austria	10.7	10.6	7.9	7.4	3.7	4.3
EU-6[a]	11.9	9.3	7.0	6.2	4.3	5.0
EU-28 + NO	12.9	10.2	8.4	6.9	2.8	3.2

Source: Eurostat, national accounts. [a]EU-6 includes BE, DK, FI, IE, NL and SE.

Table 3 shows the structure of investment by type of assets for the period 2005-2008 and 2010-2014 by broad industry groups. This makes it possible to compare the structure of investment before and after the economic and financial crisis in 2009. Investment is disaggregated into three categories: structures, equipment, and intellectual property products. Between 2010 and 2014, 48 per cent of total investment was in structures, 33 per cent in equipment, and 20 per cent in intellectual property. However, there are remarkable differences across industries. The share of investment in intellectual property is highest in information and communication,

manufacturing, and financial and insurance activities ranging between 47 and 56 per cent. In these industries investment in intellectual property is higher than that of investment in equipment or structures. The higher share of intellectual property products in the information and communication sector and manufacturing is partly related to the high share of investment in R&D activities and software. A key finding is that the share of intellectual property products increased rapidly as compared to pre financial crises period. The increase is most pronounced in information and communication services (+12 percentage points), construction (+8 percentage points), manufacturing (+6 percentage points), and professional and technical services (+5 percentage points). Exceptions include financial and insurance activities, and arts, entertainment and recreation with a stagnation of the IPP investment share.

Table 3: Structure of gross fixed capital formation by type of asset and by industry in Austria between 2005 and 2008 and between 2010 and 2014

	Total construction		Machinery and equipment and weapons systems		Intellectual property products	
	2005-2008	2010-2014	2005-2008	2010-2014	2005-2008	2010-2014
Total - All NACE activities	50	48	34	33	17	19
Industry (except construction)	19	15	50	48	32	37
Manufacturing	13	10	47	42	41	47
Construction	56	25	35	58	9	17
Wholesale, retail trade, transport, accommodation & food service activities	45	45	43	40	12	15
Information and communication	4	6	52	38	44	56
Financial and insurance activities	20	13	33	40	47	47
Real estate activities	98	98	2	2	0	0
Professional, scientific, technical activities, administrative, support services	12	8	76	74	13	18
Arts, entertainment and recreation other service activities	36	38	32	31	32	30

Source: Eurostat , national accounts.

Having found that the structure of investment changes towards intellectual property products, it is interesting to compare the investment structure to a group of EU countries with similar size and GDP per capita. Table 4 shows the structure of gross fixed capital formation for the EU-28 countries plus Norway and for selected EU countries (EU-6) which exhibit a similar GDP per capita and size as Austria. The results for the EU countries confirm that the structure of

investment is changing towards intellectual property products. For instance, in the group of EU-6 countries the share of investment in intellectual property products increased from 19 to 25 per cent between the periods 2005 to 2008 and 2010 to 2014, whereas in the EU-28 countries the IPP investment share increased from 13 to 16 per cent. It is interesting to note that IPP investment share in Austria is lower than in a number of other advanced EU countries, notably Ireland (30 per cent), Sweden (28 per cent), Denmark (25 per cent), the Netherlands and the UK (23 per cent). It is also worth noting that the speed of change towards IPP investment is most pronounced in the group of advanced EU countries. This is the first important finding of the study: Both the level of investment in IPP and its change over time is lower in Austria than in a group of EU countries with similar size and GDP per capita.

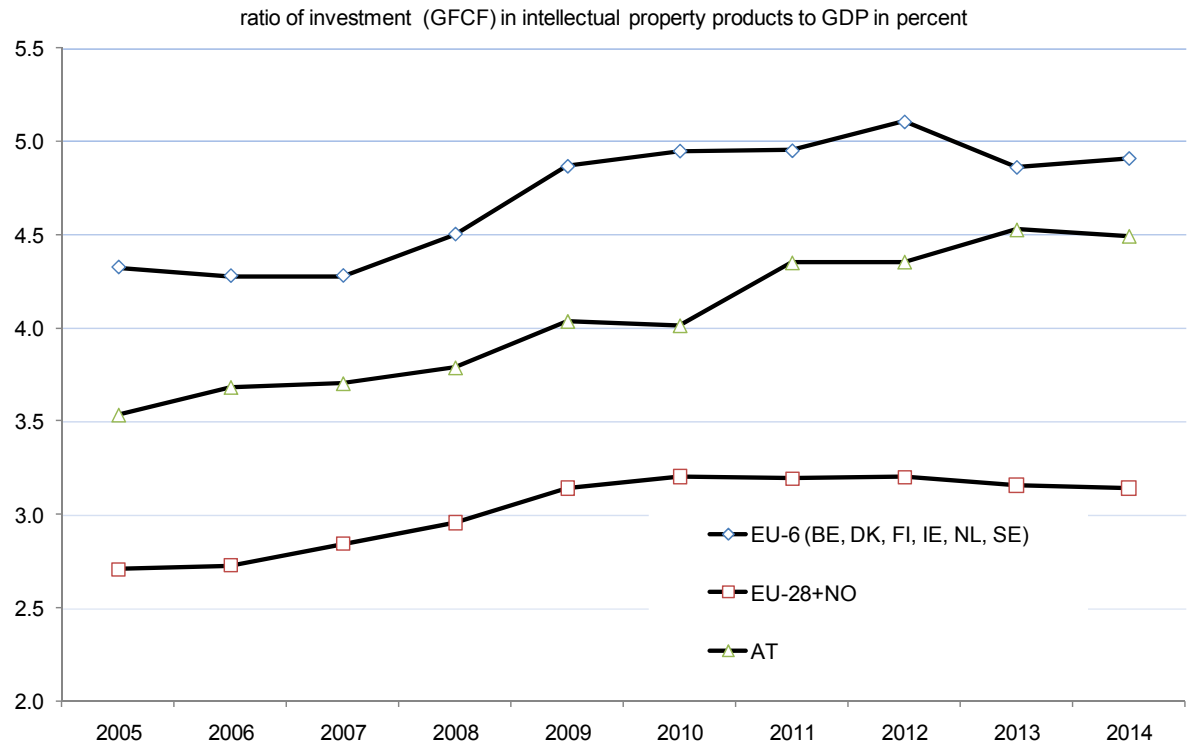
Table 4: Structure of gross fixed capital formation by type of asset in Austria and in the EU-28 between 2005 and 2014 (Total - All NACE activities)

	Total construction		Machinery and equipment and weapons systems		Intellectual property products	
	2005-2008	2010-2014	2005-2008	2010-2014	2005-2008	2010-2014
Austria	50	48	34	33	17	19
EU-6[a]	51	46	30	30	19	25
EU-28 + NO	54	51	33	34	13	16

Source: Eurostat, national accounts. EU-6 includes BE, DK, FI, IE, the NL and SE.

Figure 2 shows the ratio of IPP investment to GDP. In the EU countries the ratio of investment in intellectual property products to GDP is about 3.2 per cent on average in 2014 and increased by 0.7 percentage points from 2005 to 2014. Using a broader definition, CHS (2012) find that in the EU countries, the ratio of intangible investment to GDP has doubled since 1995 and now stands between five and 10 per cent. In Austria the ratio of investment in intangible assets to GDP is 4.5 per cent in 2014. This gap was larger in 2005 indicating that the IPP investment gap has been slightly decreasing over time but is still significant.

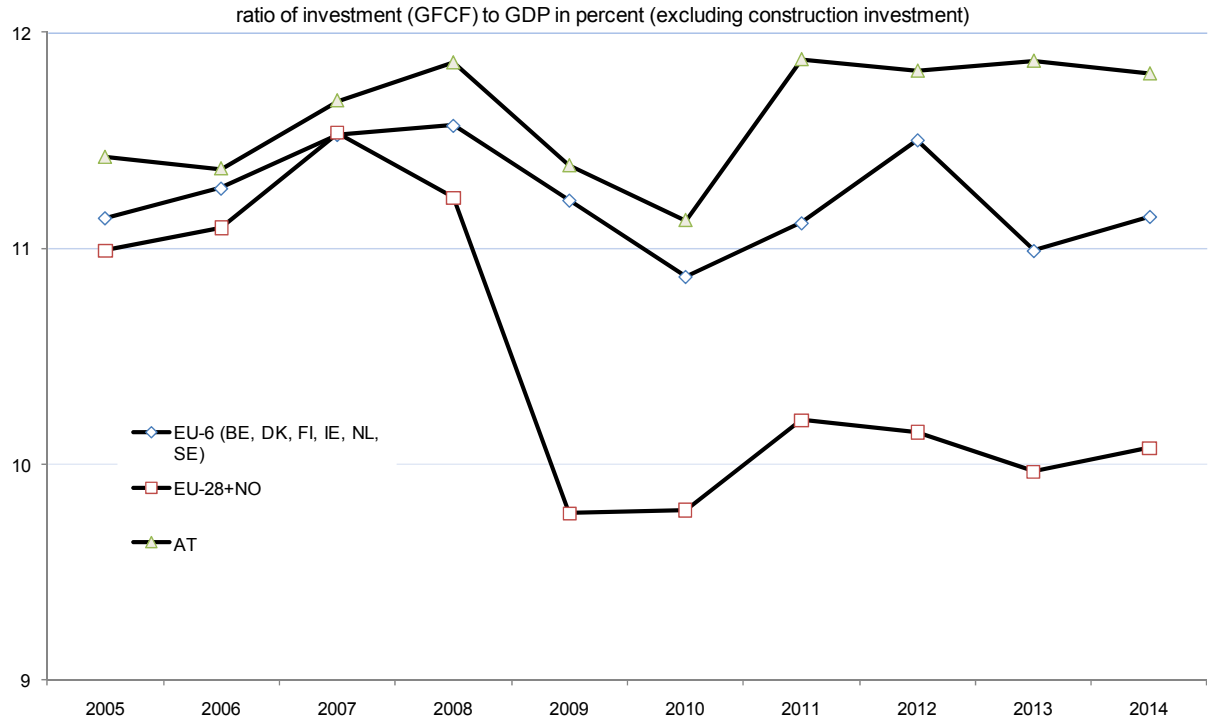
Figure 2: Evolution of the ratio of IPP investment



Source: Eurostat national accounts. ¤EU-6 includes BE, DK, FI, IE, the NL and SE.

When looking at the share of total machinery and equipment and IPP investment one can obtain a different picture (Figure 3). In 2014 the share of investment in equipment and intellectual property products is slightly higher in Austria than in the groups of countries with similar size and GDP per capita (with a difference of one percentage point to this country group). Furthermore, the ratio of investment in equipment and intellectual property products to GDP has been stable from 2008 onwards. The general high level of machinery and equipment investment in Austria in comparison to the comparison group is related to differences in the economic structure with a dominance of capital intensive industries (producers of intermediate and supplier goods).

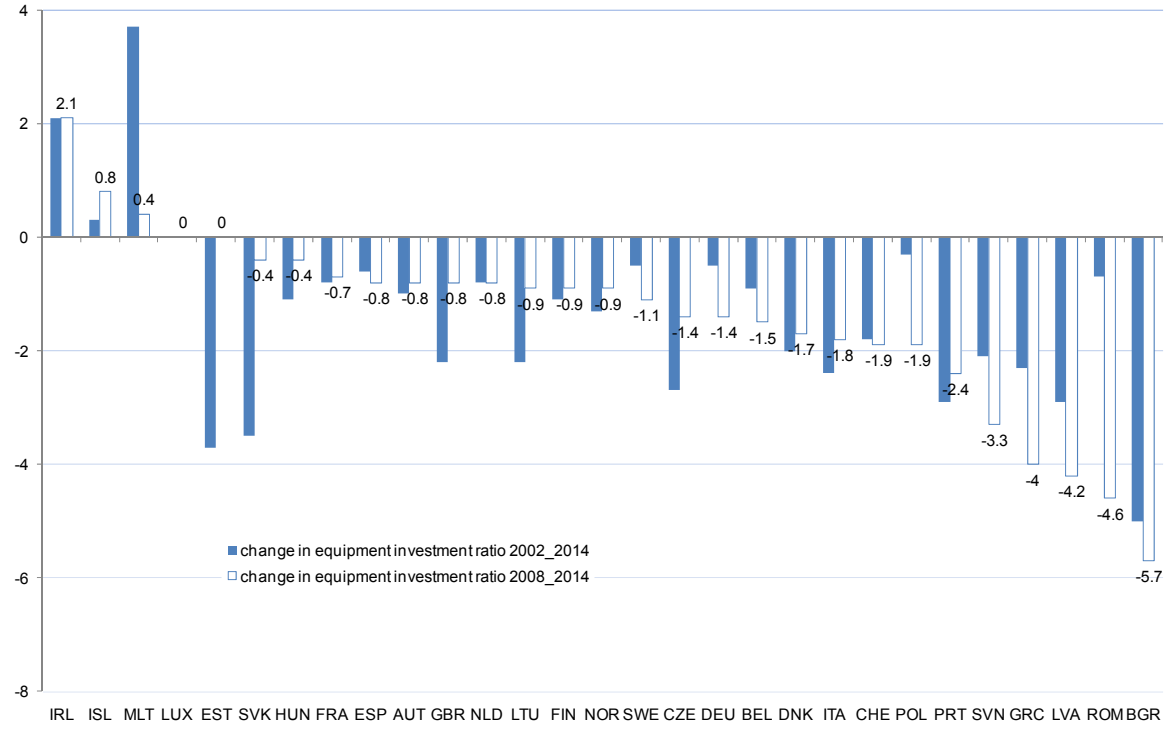
Figure 3: Evolution of the ratio of machinery and equipment and IPP investment



Source: Eurostat national accounts. ¤EU-6 includes BE, DK, FI, IE, the NL and SE.

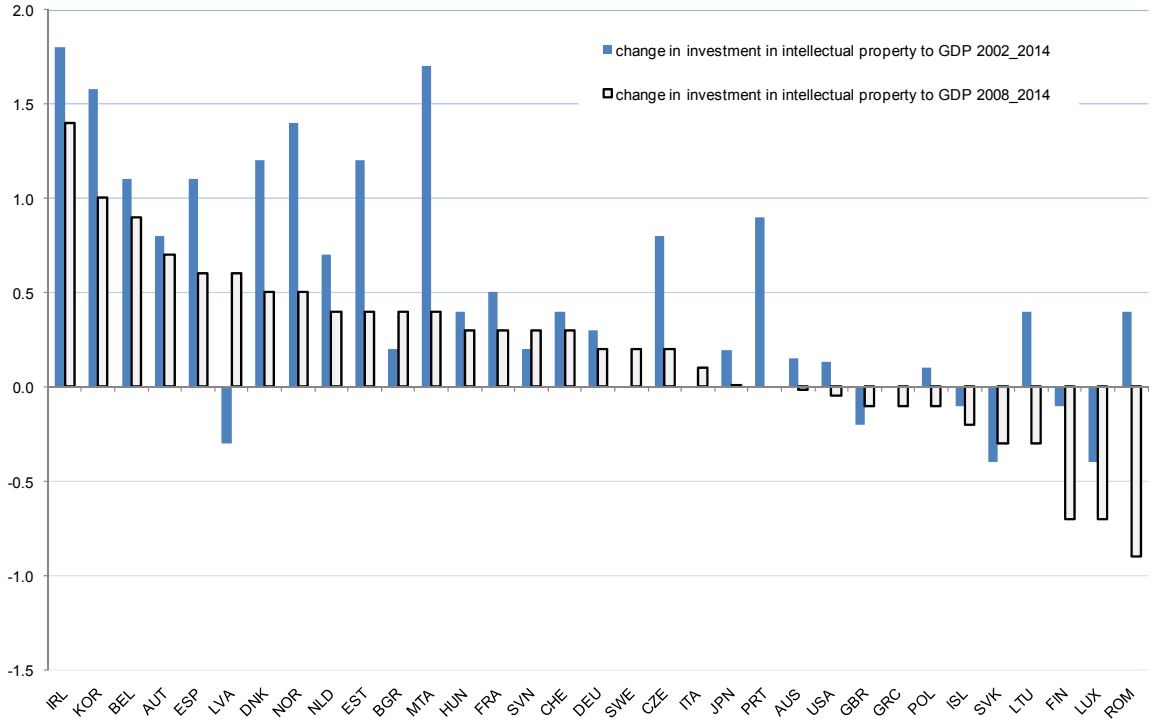
Figure 4 shows the ratio of machinery and equipment investment to GDP at the detailed country level. Figure 5 shows the corresponding results of the IPP investment to GDP ratio. The findings show that the share of equipment investment decreased in the majority of EU countries over the sample period. On average between 2008 and 2014 the ratio of machinery and equipment investment to GDP declined by one percentage point (from 7.9 to 6.8 per cent). In Austria the decline is slightly less pronounced with 0.8 percentage points. In contrast, investment in intangible assets (or intellectual property as defined in the ESA 2010) increased considerably, with the highest increases in Ireland, Korea, Belgium and Spain (Figure 5).

Figure 4: Change in ratio of equipment and machinery investment to GDP 2002-2014



Source: Eurostat.

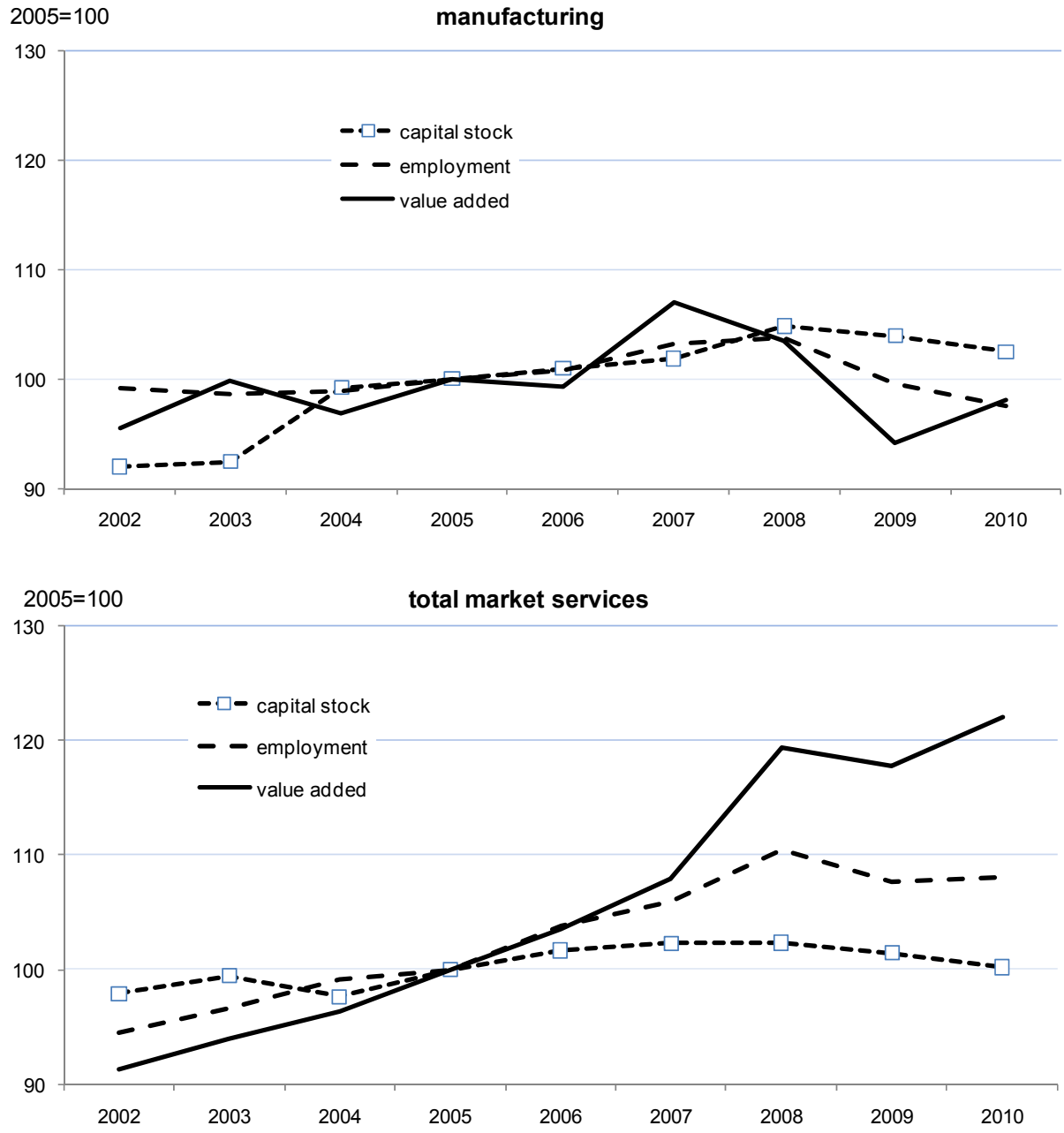
Figure 5: Change in ratio of investment in intellectual property to GDP in industrialized countries 2002-2014



Source: Eurostat.

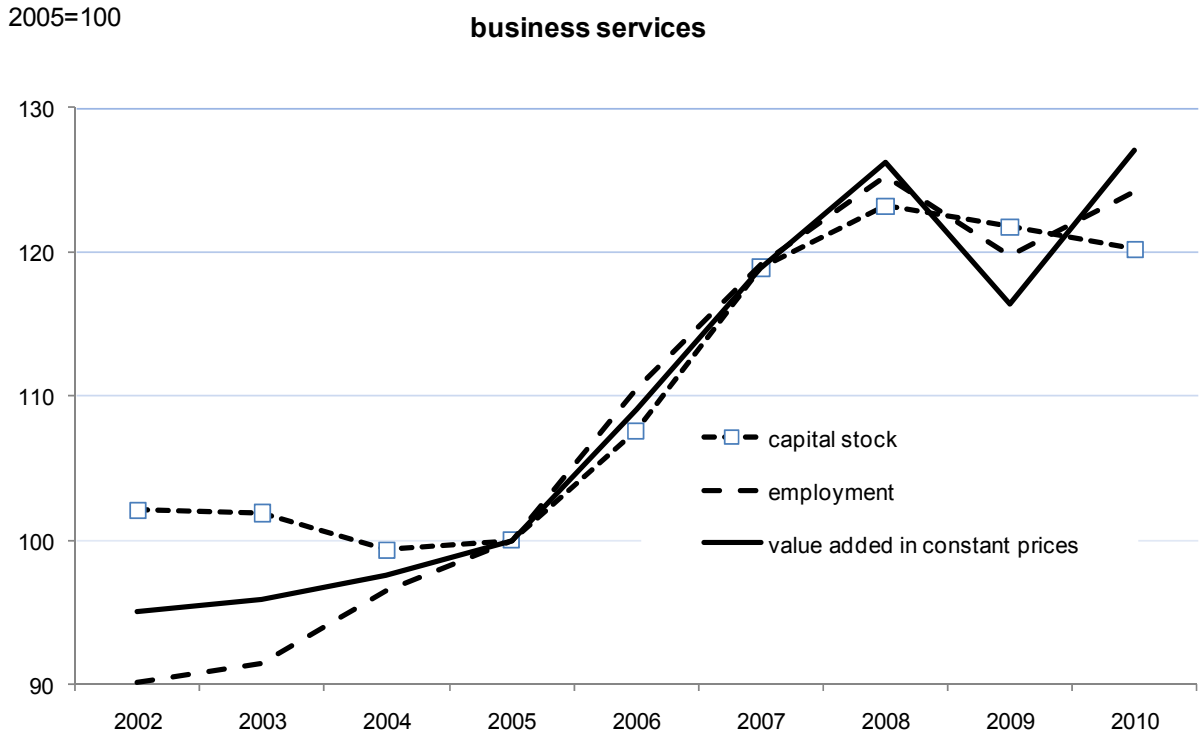
The next step is to compare the evolution of capital stock with those of real value added and labour input. Figure 6 shows the evolution of the key production factors for 2002 to 2010 by broad industry groups (manufacturing and services).

Figure 6: Evolution of capital stock, employment and value added in Austrian manufacturing and services (2001-2010)



Notes: Nominal values are deflated by the value added deflator with a base year (time series are not chained). Source Eurostat. ESSLAIT MMD database.

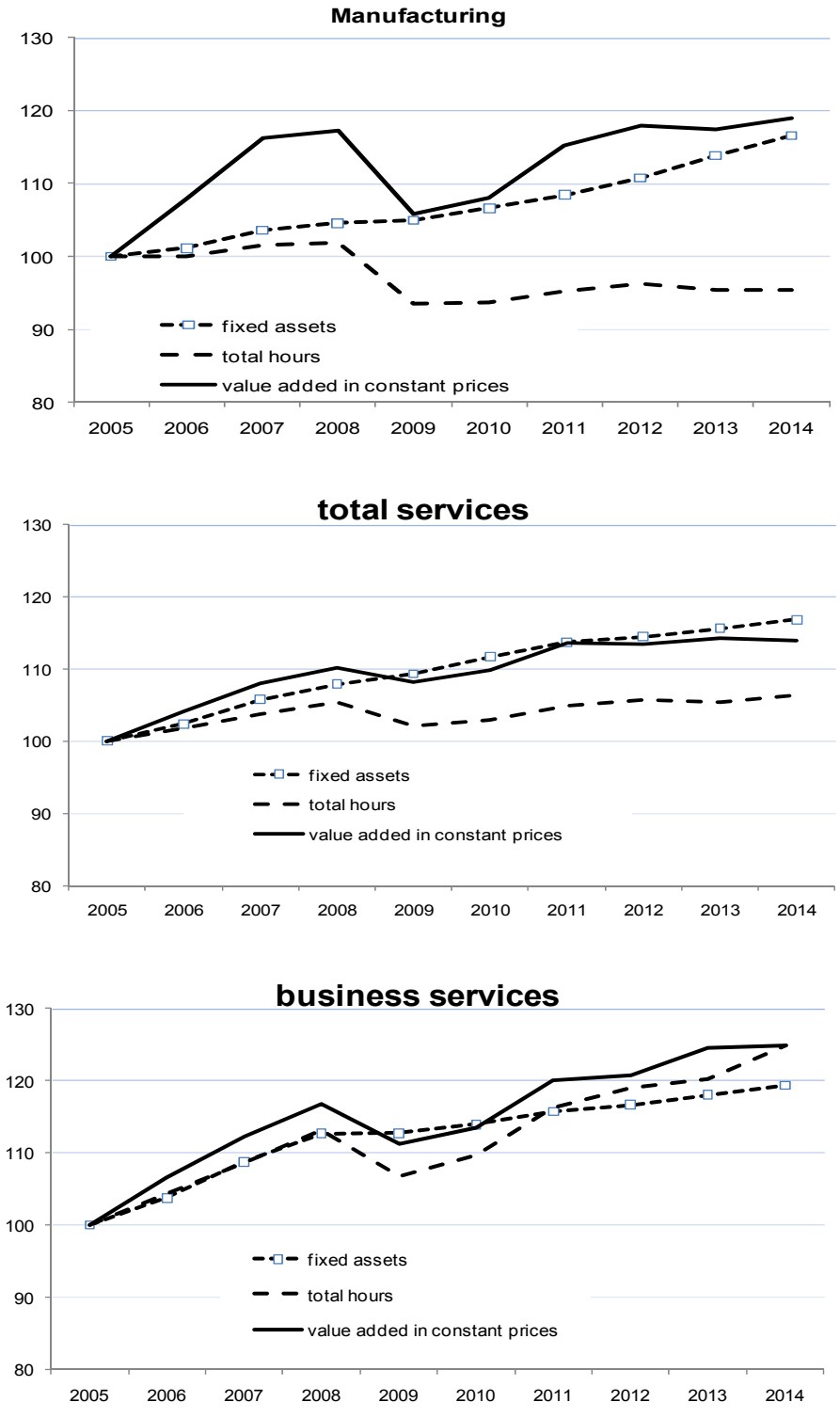
Figure 7: Evolution of capital stock, employment and value added in business services (2001-2010)



Notes: Nominal values are deflated by the value added deflator with a base year (time series are not chained). Source Eurostat. ESSLAIT MMD database.

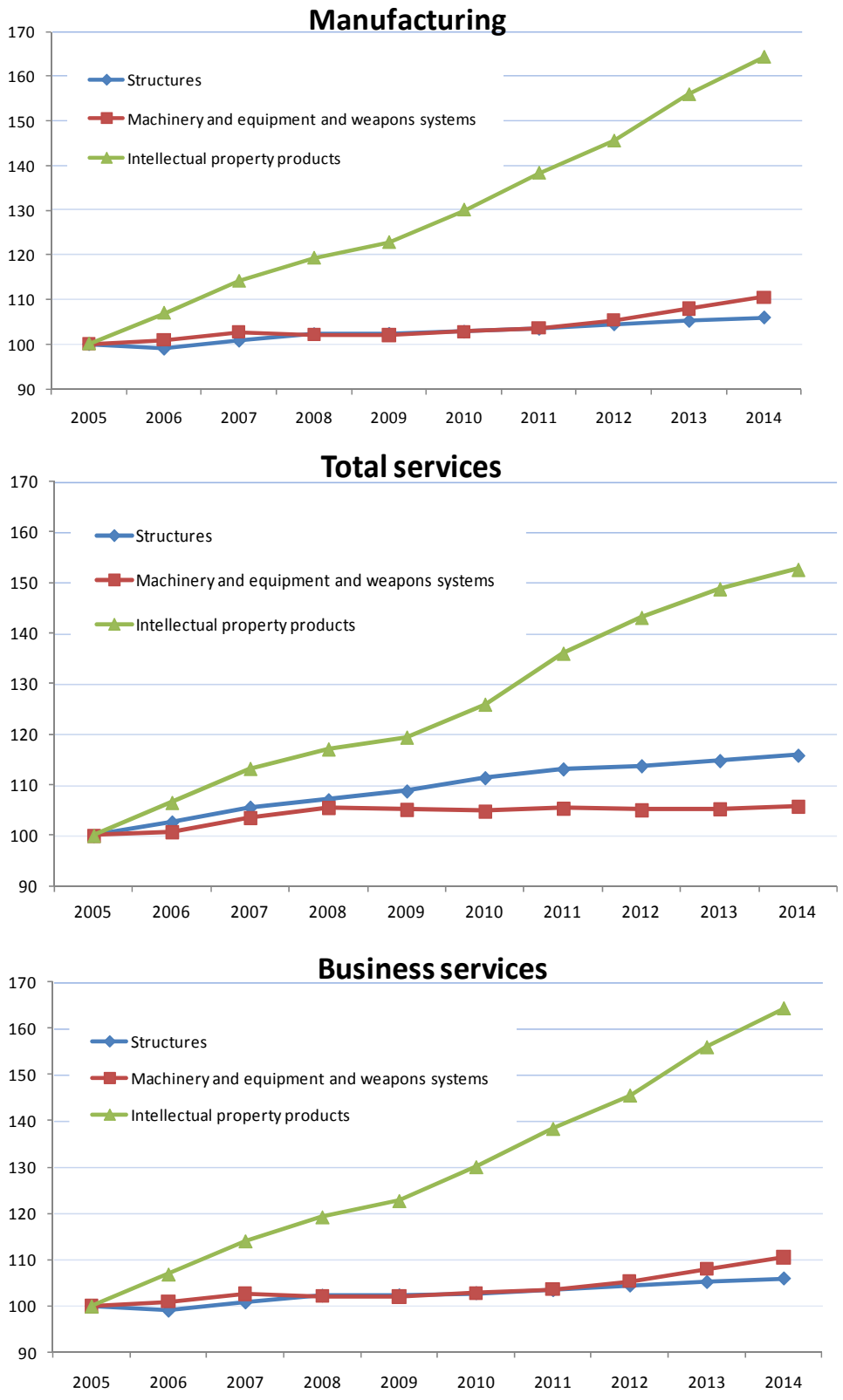
For manufacturing, the capital stock in constant prices increased by 1.3 per cent per year on average. Thus the growth rate of capital accumulation is slightly lower then the growth rate of net production (measured in value added in constant prices). This indicates that capital productivity is rising over time similarly to labour productivity. In services the capital stock is stagnating (+0.2 per cent per year on average between 2002 and 2010). In contrast, value added in constant prices and employment increased strongly over time indicating a strong increase in capital productivity. This clearly indicates that the expansion of production in services does not require large additional investments in fixed assets.

Figure 8: Evolution of capital stock, employment and value added in Austrian manufacturing and services (2005-2014)



Notes: Nominal values are deflated by the value added deflator with a base year (time series are not chained). Source Eurostat.

Figure 9: Evolution of capital stock by type of asset in Austria (2005-2014) (2005=100)



Notes: Value added is deflated by the implicit value added deflator with the base year 2005. Source Eurostat.

However, one should keep in mind that services are highly heterogeneous, ranging from wholesale and retail trade to business services. When looking at the evolution of capital stock in business services results show that the capital stock increased with a growth rate of two per cent per year which is similar to the growth rates of employment and value added.

Figure 8 shows the evolution of capital stock, total hours and value added in constant prices for 2005 to 2014 based on ESA 2010 national accounts data. Again, the average growth rate of capital input in manufacturing and services is about 1.7 per cent per year on average and is similar or slightly lower than the growth rate of value added in constant prices. In business services, growth of fixed assets is about 1.9 per cent per year on average. Again findings indicate that capital accumulation increased at moderate rates.

We proceed by analyzing the evolution of capital input by three different types of assets: (i) structures, (ii) equipment and (iii) intellectual property products. Figure 9 shows the evolution of capital stock by types for three broad industry groups. The results show that the evolution of fixed assets differs greatly by type of investment. While fixed assets in intellectual property grew between five and six per cent per year on average between 2005 and 2014, fixed assets in equipment increased between one and two per cent per year on average. Furthermore, unlike physical capital, fixed assets in intellectual property products continued to grow during the economic and financial crises indicating that these types of investment are independent from the fluctuations of the business cycle.

2.2. Factors influencing corporate investment

Fixed investment depends on a variety of factors. These include interest rate, sales expectations, corporate tax rate and other taxes, investment incentives and grants and the investment and business climate factors, institutional factors, and inter-relations with innovation activities. Investment depends negatively on the price of capital and positively on output or expected output. The price of capital is commonly measured as the cost of capital. They are defined as the price of using one unit of capital services. The price of capital depends on a number of factors:

- Price index of new investment by type
- Tax treatment of capital purchases and capital income (corporate tax rate, depreciation allowances, investment tax credit)
- Interest rate (real rate of return on financial assets)
- Depreciation rate
- Expected profit rate

Among the different components of the user cost of capital, corporate tax rates and other investment incentives are most important. In contrast, interest rates and prices often regarded as less relevant. Often there are different rates for taxes by asset type, and different depreciation rates for SMEs and young firms.

Non price factors of investment include the following:

- Expected output
- General investment and business climate factors.

Corporate taxes

It is widely acknowledged that investment behaviour is influenced by corporate taxation. High corporate taxes hamper investment, whereas low corporate tax rates favour it. This particularly holds true for cross-border investment. Studies investigating the impact of corporate taxes on domestic

investment come to the conclusion that taxes lead to an increase in investment. Using firm level data for 14 OECD countries, Cummins, Hassett and Hubbard (1996) find a economically and significant impact of tax changes on investment demand in 12 of 14 countries. Djankov et al. (2010) measure the corporate tax rate by the effective corporate tax rate. Using macroeconomic data for 80 countries they find that a 10 percentage point increase in the 1st year effective corporate tax rate reduces the investment to GDP ratio by about two percentage points. More recently, using firm level data for 40 countries Egger et al. (2014) find that a 10 percentage-point increase of the corporate tax rate implies a reduction of investment growth between 18 and 35 per cent.

Furthermore, studies find a negative impact of the corporate income tax rate on a firm's intangible assets (Dischinger and Riedel, 2011; Ernst and Spengel, 2011 and Griffith et al. 2014). This a bit surprising since intangible assets are skill intensive activities which mainly depend on the supply of qualified labour. In addition, previous empirical studies widely agree that FDI flows are highly sensitive to changes in corporate tax rates of the host and also the parent countries, and ultimately matter for the location choice of multinational firms. In general, higher parent country tax rates lead to higher FDI outflows, whereas a higher host country tax rate leads to lower FDI inflows. Measuring corporate taxation is a non-trivial issue (De Mooij and Ederveen, 2003; Feld and Heckemeyer, 2011). Statutory corporate rates are the most obvious measure and are readily available but are often not an accurate measure of the effective tax burden. Effective average tax rates (EATR) are more appropriate since they capture many details of the tax system such as possible tax exemptions (De Mooij and Ederveen, 2003). However, in their meta-analysis, Feld and Heckemeyer (2011) find that the tax effects are not sensitive regardless of whether corporate taxes are measured as the effective average tax or the statutory tax rates.

User costs of capital

In a recent survey, Hasset and Hubbard (2002) suggest that the elasticity of the capital stock with respect to the tax adjusted user cost is probably between -0.5 and -1. This indicates that the sensitivity of capital stock with respect to prices is relative modest. Few studies have investigated the impact of user costs of capital on investment behaviour in Austria. One exception is the study by Valderrama (2001) based on firm level data drawn from balance sheets. The author shows that a reduction in the user cost of capital positively affects investment. However, the effect is relatively low with an elasticity of -0.14. Expected demand is more important with an elasticity of 0.26. Furthermore, the author shows that the investment stimulating effect of a reduction in the user cost of capital is higher for large and established companies than for young and small businesses.

Expected output and cash-flow

Empirical results for industrialized countries show that output or cash flow have a much larger economic impact on investment than the user costs of capital (Valderrama, 2001).

Access to financing

Access to financing also plays an import role in the investment decision, particularly for small firms. After the economic and financial crisis, SMEs are increasingly facing difficulties in accessing formal credit. It is well know that SMEs are more dependent on credits as compared to large firms. European SMEs primarily rely on short and long-term bank credits and to a lesser extent on internal sources (ECB, 2014; Ferrando and Griesshaber, 2011; Holton et al. 2014; Kraemer-Eis et al., 2015).

Investment climate factors

An unfavourable investment climate and product-market regulations are likely to discourage domestic investment and also foreign direct investment since they lead to higher investment costs. Investment climate factors have many dimensions such as legal, legislative and regulatory frameworks.

Investment demand not only depends on corporate taxes but also on institutional and corporate governance variables such as strength of investor protection, board composition and voting rights (Egger et al., 2014). Using firm level data for 40 countries, Egger et al. (2014) show that the strength of investor protection has a significant and positive effect on domestic investment. For the OECD countries, Golub et al. (2003) find that both FDI restrictions and product market regulations are significantly negatively related to FDI activity.

3 Stylized facts on investment support measures

This chapter gives an overview of direct and indirect support measures and policy factors likely to have an impact on investment. Public financial support to private investments comes in two forms: (i) direct funding of specific investment projects or reduced interest loans, and financial guarantees, and (ii) fiscal incentives allowing companies to reduce tax payments (Table 5). Fiscal incentives consist of several forms including investment tax credit (incremental or volume based) or a change in the depreciation regime. Reductions in the corporate tax rate also belong to indirect investment support measures. Fiscal incentives can be designed temporarily or permanently. Often additional fiscal incentives are limited for a certain period of time. Examples of temporary measures are the incremental investment tax credit (Investitionszuwachsprämie) introduced in Austria between 2002 and 2004 or the introduction of the (temporary) accelerated (bonus) depreciation regime introduced in 2009/2010. In addition, fiscal incentives can be specific to specific types of investment such as R&D, environmentally friendly assets or specific target sectors. Eligibility criteria for direct investment support measures depend on the size of the firm or the location of firms (developed or less developed regions). According to EU competition law, possibilities to provide investment subsidies for large firms in developed areas do not exist.

Table 5: Overview of direct and indirect investment support measures

Direct investment support measures	**Indirect support/fiscal incentives**
SMEs less developed regions	investment credit
- European Regional Development Fund	- incremental/volume based
- ESF	- limited to specific activities/industries
- ERP regional programme	- temporary or permanent
- aws guarantees (e.g. innovation and growth)	- firm size or age specific
SMEs developed regions	depreciation regime
- ESF	corporate tax rate
- ERP regional programme	- general/specific
- aws guarantees (e.g. innovation and growth)	-dividend policies/ group taxation
large firms less developed regions	group taxation
- ERP regional programme	
- EIB-Growth Finance Initiative	
large firms developed regions	
- investment subsidies legally not possible	

Source: Own compilation based on the literature.

There are several differences in aims, goals, coverage and target groups between fiscal incentives for investment and direct funding of investment projects. With respect to direct support, funding agencies have more scope to make choices about which investment projects they intend to support. For instance, the EIB-Growth Finance Initiative targets medium-sized research-intensive and innovative companies that meet the following requirements: (i) 500 to 3,000 employees (on a consolidated basis) and (ii) ratio of R&D to total sales of five per cent or more. (http://www.eib.org/products/blending/innovfin/products/index.htm).

Note that within the EU, State Aid regulations generally prohibit the provision of financial incentives to firms unless such policies are in the common interest of the Union. Areas of common interest include the promotion of small and medium sized enterprises, research and development (R&D), training, protection of the environment, and development of disadvantaged regions.

Investment support mainly consists of guarantees and loans. The European Regional Development Fund (ERDF) targets several key areas: (i) innovation and research, (ii) the digital agenda and (iii) the low-carbon economy. In general investment support is restricted to SMEs in less developed EU regions (in AT: Burgenland). The Austria Wirtschaftsservice (AWS) explicitly targets small

and medium-sized enterprises and start-up companies. Again, typical support measures consist of grants, guarantees, or loans at a low interest rate. The largest funding agency for investment is the Austria Wirtschaftsservice (AWS).

Table 6: Direct investment grants provided by the AWS as a percentage of total investment

	NPW (net present value (Barwert=)	Investment in the business sector (excl. real estate, agriculture, public services, banking and insurance)	
	in mill	in mill	ratio in per cent
2006	356	8846	4.0
2007	149	8940	1.7
2008	233	9367	2.5
2009	193	7899	2.4
2010	138	7485	1.8
2011	153	8161	1.9
2012	149	8836	1.7
2013	127	8415	1.5
2014	108	8602	1.3

Notes: AWS Leistungsberichte, Statistic Austria.

Table 6 gives an indication of the amount of investment grants relative to total private investment (in the business sector). Here investment grants are measured as the net present value. The results show that the ratio of investment subsidies was 1.3 per cent in 2014 and steadily declined over time. Before the economic and financial crisis the investment support level was twice as large (2.7 per cent on average for the period 2006 to 2008). Reasons for the decline are not fully understood. Overall, investment support for innovative small and young companies is crucial factor for their expansion plans. Often investment projects can not be financed without publicly financed investment grants and guarantees. Declining investment support over time indicates that incentives for private investment are no longer a priority of policymakers.

The COFOG Eurostat database can be used to compare the evolution of investment grants to companies across countries and over time. Table 7 shows the development of public investment grants for companies across EU-countries plus Switzerland. In Austria in 2014, the level of public investment

grants for companies as a percentage of GDP is less than 0.1 per cent. In the EU-6 countries the corresponding figure is 0.2 per cent; whereas in Germany the level is 0.4 per cent and 0.6 per cent in Switzerland. The Scandinavian countries, Belgium, Ireland and the Netherlands thus spend more than four times as much on public investment grants as Austria; Switzerland even ten times as much. In Austria compared to the period before the financial and economic crisis, public investment grants for companies as a percentage of GDP declined from 0.2 per cent to 0.07 per cent which is equal to a 70 per cent decline. Thus the decline is more pronounced than in any other EU country with similar economic performance and size. Looking at public subsidies (instead of investment grants) to enterprises leads to a similar picture. The ratio of subsidies to enterprises (excluding agriculture) to GDP is significantly lower in Austria than in EU countries with similar economic performance and size (0.8 per cent vs. 1.2 per cent) (Table 7).

Little is known about the reasons of cuts in public investment grants. One reason could be that there are currently fewer funds available for investment grants. Instead, the direct capital transfers to companies increased steadily in 2014.

Table 7: Investment grants and subsidies for the business enterprise sector

	Investment grants for business enterprises (excl. agriculture)									
	as a percentage of GDP								Change in percentage points	
	2000-2004	2005-2008	2009	2010	2011	2012	2013	2014	2014/2000-2004	2014/2005-08
	Investment grants for the business enterprise sector as a percentage of GDP (excl. agriculture)									
Austria	0.64	0.19	0.10	0.10	0.11	0.10	0.04	0.05	-0.60	-0.14
Germany	0.57	0.46	0.50	0.56	0.47	0.43	0.45	0.36	-0.12	-0.10
EU-6	0.18	0.19	0.21	0.19	0.20	0.20	0.16	0.18	-0.02	0.00
Switzerland	n.a.	0.52	0.63	0.60	0.56	0.51	0.54	n.a	0.51	0.02
	Investment subsidies for business enterprises (excluding agriculture)									
	as a percentage of GDP								Change in percentage points	
	2000-2004	2005-2008	2009	2010	2011	2012	2013	2014	2014/2000-2004	2014/2005-08
Austria	1.3	0.9	0.9	0.9	0.8	0.9	0.8	0.8	0.82	-0.10
Germany	0.8	0.5	0.7	0.6	0.5	0.5	0.4	0.4	0.44	-0.11
EU-6	0.9	0.9	1.1	1.1	1.2	1.2	1.2	1.2	1.18	0.29
Switzerland	n.a.	0.8	0.7	0.7	0.8	0.8	0.8	n.a	0.00	0.01

Source: Eurostat. COFOG Datenbase.

For Austria little is known about the impact of direct investment grants on private investment. In principle direct investment support measures have to be reported in the annual reports. However, the amount of investment grants can be phased in over time so that the amount reported in the balance sheet does not correspond to the actual grant received. This makes it difficult to evaluate the impact of investment subsidies on privately financed investment or its wider effect on performance.

When turning to fiscal incentives, several forms are available. First, often accelerated depreciation rules for investment are available particularly for investment in equipment and also for R&D expenditures. Second, tax allowances make it possible to deduct an additional percentage of the tax base. Third, tax credits allow firms to deduct a certain share of their investment directly from their tax liabilities. These fiscal incentives often apply for R&D investment rather than investment in general.

A critical choice has to be made between the volume based or incremental funding regime scheme. Incremental schemes only subsidise additional investment above a given threshold (previous years or average of several previous years) (as in the case of the "Investitionszuwachsprämie"). However, incremental funding regimes require high monitoring and administration costs (Gravelle, 1993).

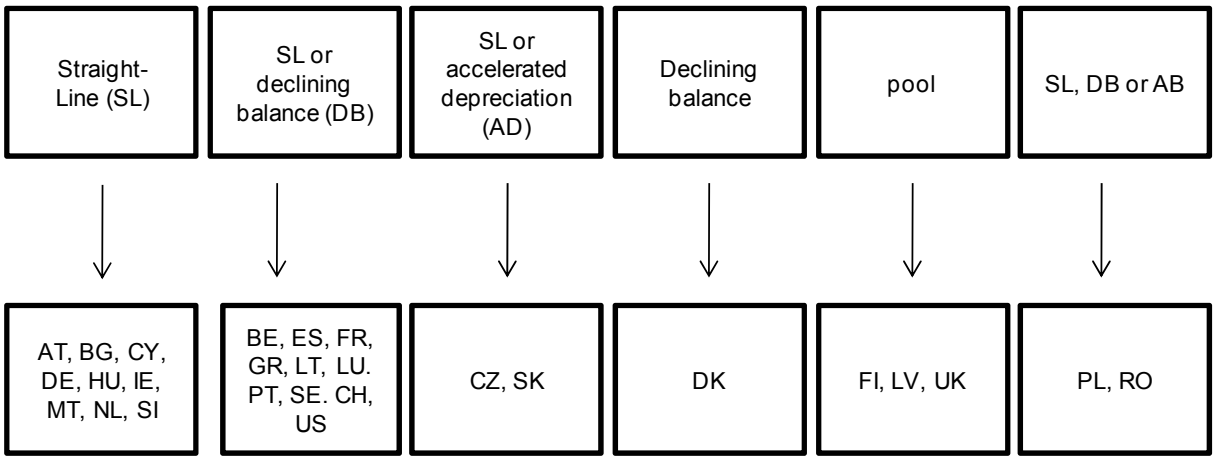
Investment tax credits and bonus depreciation belong to classic investment support measures. Gravelle (1993) suggests that investment tax credit is typically applied to equipment and thus has distorting effects across the different types of assets. It is distorting because it favours short lived assets. However, since the 1990s there has been a general tendency to broaden the tax base by abolition of specific depreciation allowances or investment tax credits while at the same time reducing the corporate tax rate (Leibfritz, Thornton, & Bibbee, 1997). This trend has continued over the last years.

The depreciation method can also influence investment behaviour. Straight line or declining balance methods are two of the most common methods

used (Spengel and Zöllkau, 2012). Under the straight line method the useful life of an asset is fixed at a certain number of years. An alternative is the accelerated variation of the straight line method, under which the asset is depreciated at higher rates at the beginning of the asset's useful life. Depreciation methods and depreciation rates vary widely across EU countries. The main depreciation method for long life machinery and equipment is straight line, straight line or declining balance as well as other mixed methods (Spengel and Zöllkau, 2012). Austria belongs to the country group of the straight line deprecation method which from the point of view of firms consists of the least generous depreciation regime (Figure 10).

There is also substantial variation in depreciation rates for long life machinery and equipment across EU countries (Spengel and Zöllkau, 2012). In general deprecation rates for long life machinery and equipment are high with maximum rates ranging between 25 and 40 per cent. The higher the depreciation rate, the higher the depreciation expense and tax expenses. Austria has a relatively moderate depreciation rate of a maximum of 16.67 per cent (Table 8). For industrial buildings, variation in depreciation rates across countries are less pronounced than for other asset types (Spengel and Zöllkau, 2012).

Figure 10: Depreciation method of long life machinery and equipment by country



Source: Spengel and Zöllkau 2012.

Table 8: Depreciation rate for long life machinery and equipment by country

Austria	3-16.67	Italy	2.5-14
Belgium	3-10	Latvia	15-40
Bulgaria	25	Lithuania	3-8
Croatia		Luxembourg	5-15
Cyprus	12.5-16.7	Malta	4-16
Czech Republic	10	Netherlands	5 min
Denmark	21	Poland	7-10
Estonia	no	Portugal	3-20
Finland	25	Romania	useful
France	3-20	Slovakia	4-12
Germany	3-16.67	Slovenia	3-10
Greece	3-.33.3	Spain	4-12.5
Hungary	2-7	Sweden	5
Ireland	8	United Kingdom	10

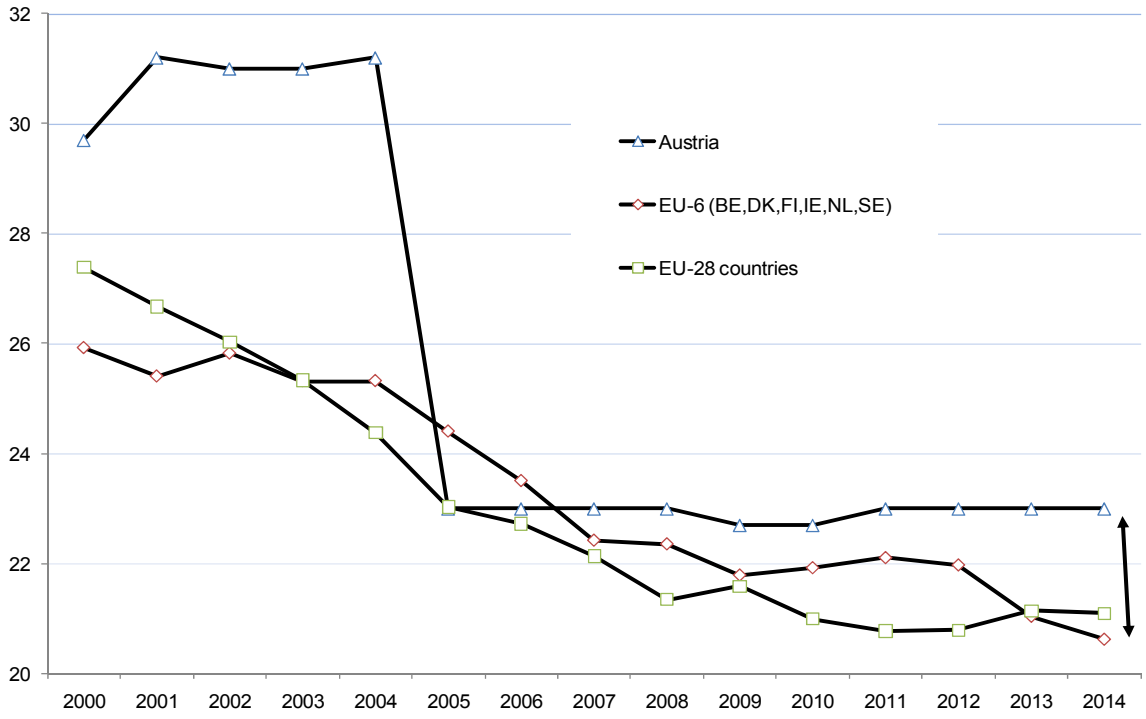
Source: Spengel and Zöllkau 2012.

Wakeman (1980) compares different depreciation regimes and finds that the accelerated depreciation method is more beneficial for firms when taxable income is known and positive because it yields a lower expected value of discounted tax payments. It is obvious that an investor who chooses accelerated depreciation over straight line depreciation realizes larger initial depreciation tax savings. The difference between accelerated and straight-line is the timing of the depreciation. An accelerated method will lead to higher depreciation expenses in the early years of an asset's useful life as compared to straight line. For profitable companies, the use of accelerated depreciation on the income tax return will lead to smaller cash payments for income taxes in the earlier years of an asset's useful life and higher cash payments for income taxes in later years as compared to straight line.

The straight-line method is considered as inferior to other depreciation regimes because the present value of the tax burden in the combined linear - degressive is lower (Eilenberger, 2003). Sinn (1988) shows based on a theoretical model that the accelerated tax depreciation regime leads to a permanent increase in investment, even if the tax rate goes back to its normal level.

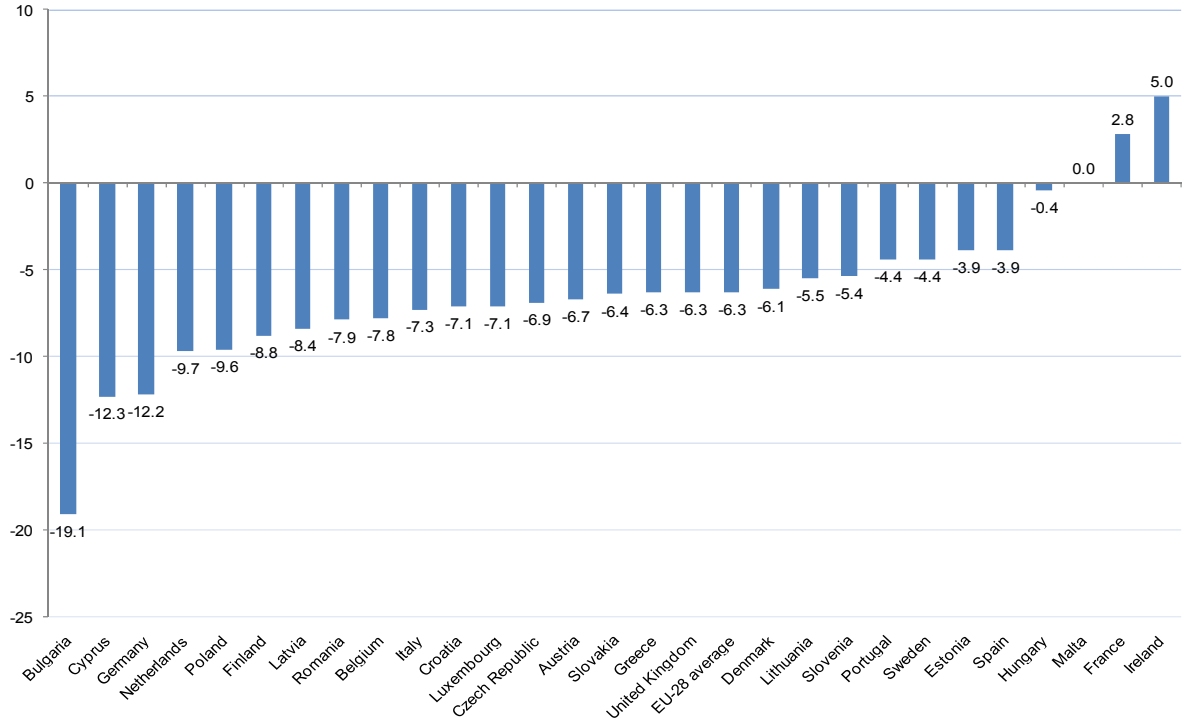
Effective average tax rates declined in all industrialized countries between 2000 and 2014 (Figure 11 and Figure 12). Exceptions are Ireland and France, the latter of which introduced a patent/IP box tax regime, and the former of which increased corporate taxes starting from the lowest level in the EU countries. The strong decrease in corporate taxes can be observed for both the adjusted top statutory tax rate on corporate income and the effective average tax rates (Figure 13). The decline can be observed not only in new Member States but also in advanced EU countries. In particular, in EU countries with similar GDP and size to Austria, the EATR decreased from 24 to 21 per cent between 2005 and 2014. In contrast, Austria's EATR is stable at about 23 per cent. Thus the relative attractiveness of Austria relative to the comparison group has deteriorated. This gap in the corporate tax rate will increase in coming years and may lead to the need to adjust the corporate tax rates downwards. For Eastern European countries, the main motivation for lowering the corporate tax burden is to attract new foreign direct investment. For advanced European countries, the ongoing pressure to lower corporate taxes is surprising because other industrialised countries outside the EU have maintained their level of taxes. Large reductions in the EATR can also be observed for Finland, the Netherlands and Germany.

Figure 11: Evolution of the effective average corporate tax rate 2000-2014



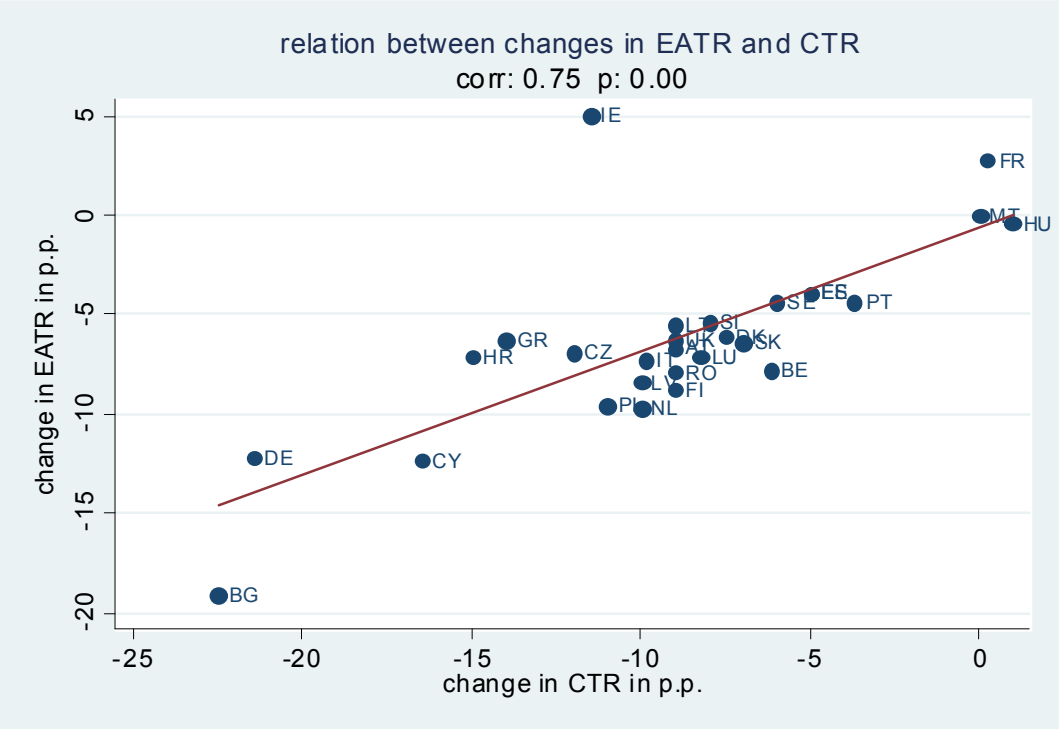
Source: European Commission (2015).

Figure 12: Evolution of the EATR across EU-countries 2000-2014 (percentage points)



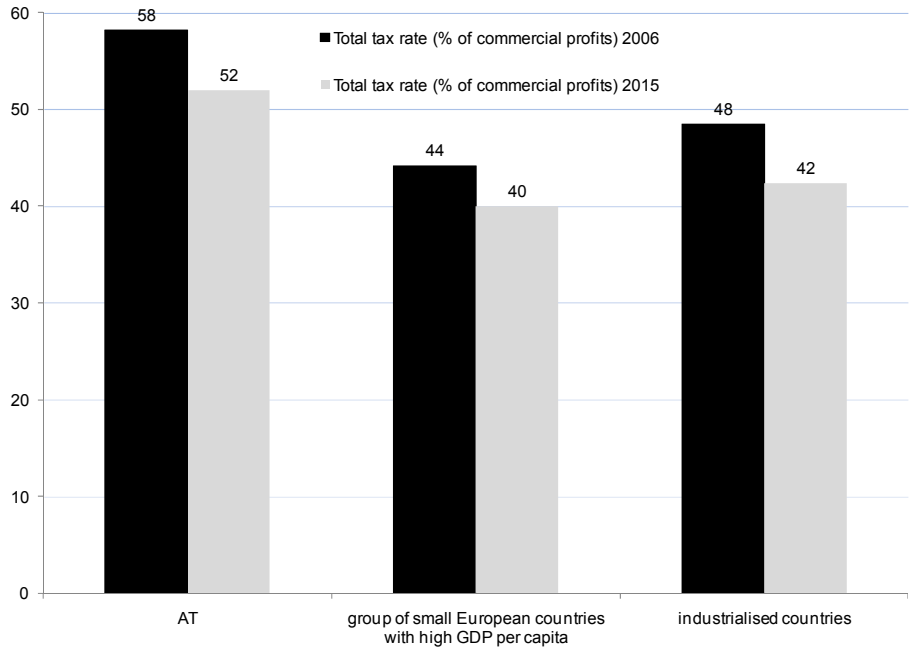
Source: European Commission (2015).

Figure 13: Evolution of corporate taxes across EU-countries 2000-2014



Source: European Commission (2015)

Figure 14: Total tax rates (profit tax, tax on labour and other contributions and other taxes)



Source: World Bank Doing a business database.

The relatively high tax rate of Austria compared to countries with similar GDP per capital is even more pronounced when the total tax rate is considered. The total tax rate (profit taxes, labour taxes and social security contributions as a percentage of total commercial profits) is 12 percentage points higher than in the comparison group (EU-6) despite recent reforms (Figure 14).

Table 9: Effective average tax rate by type of asset 2014

	Corporate tax rate	Industrial buildings	Intangibles	Machinery
Austria	25.0	23.0	23.4	22.3
Belgium	34.0	30.6	20.4	25.2
Bulgaria	10.0	9.5	8.6	7.8
Croatia	20.0	15.0	14.5	14.8
Cyprus	12.5	14.8	10.2	10.4
Czech Republic	19.0	16.0	16.0	15.1
Denmark	24.5	24.7	17.0	21.5
Estonia	21.0	16.5	16.5	16.5
Finland	20.0	19.6	18.7	14.4
France	38.9	46.9	35.2	35.5
Germany	31.0	29.1	25.6	28.0
Greece	26.0	22.7	24.3	25.1
Hungary	20.9	23.9	17.1	17.5
Ireland	12.5	12.8	11.7	11.5
Italy	30.9	25.8	20.4	26.2
Latvia	15.0	18.6	12.2	12.0
Lithuania	15.0	17.4	10.9	12.0
Luxembourg	29.2	27.5	23.8	22.2
Malta	35.0	31.0	32.7	29.2
Netherlands	25.0	23.9	20.3	22.3
Poland	19.0	18.4	15.5	18.4
Portugal	30.0	25.9	28.0	24.4
Romania	16.0	18.2	13.3	13.0
Slovakia	22.0	19.0	17.9	18.2
Slovenia	17.0	15.0	15.9	14.2
Spain	35.3	32.9	31.1	30.8
Sweden	22.0	19.6	17.7	18.1
United Kingdom	21.0	31.6	19.6	19.9
Norway	27.0	24.7	25.2	23.0
Switzerland	21.2	17.8	17.0	18.3
Turkey	20.0	16.4	19.2	16.7
Canada	26.5	33.6	22.0	19.3
Japan	35.7	37.7	36.5	36.9
USA	37.9	37.2	39.1	36.1
group of high GDP per capita countries (mean)	27.6	27.7	23.6	24.0
group of small and high GDP per capita countries	23.8	21.8	19.4	20.1

Source: Spengel et al. (2014).

For Austria in 2014 the EATR for machinery and intangible assets was 22 and 23 per cent, respectively (Table 9). This is similar to the average across countries.

However, when compared to countries with a similar size and GDP per capita (BE, CH, DK, IE, NL, NO, SE), one can see that Austria's EATR is between two and four percentage points higher (Table 9). The US, Japan, Brazil and India all have tax rates that are considerably above the EU-average, and even above most western Member States.

The Taxation Reforms Database provided by the European Commission makes it possible to investigate different types of investment support measures. In recent years member states have undertaken several measures to stimulate investment. Investment support measures can be grouped into four main areas:

- Change in the general corporate tax rate
- Change in depreciation allowances or investment tax credits
- Change in group taxation
- Change in taxation regime for specific subgroups of firms: SMEs or start-up companies
- Specific investment support measures

These investment support measures can be distinguished by:

- timing (temporary or permanent)
- General or specific
- Expected effects on the corporate tax burden (decrease, increase or neutral).

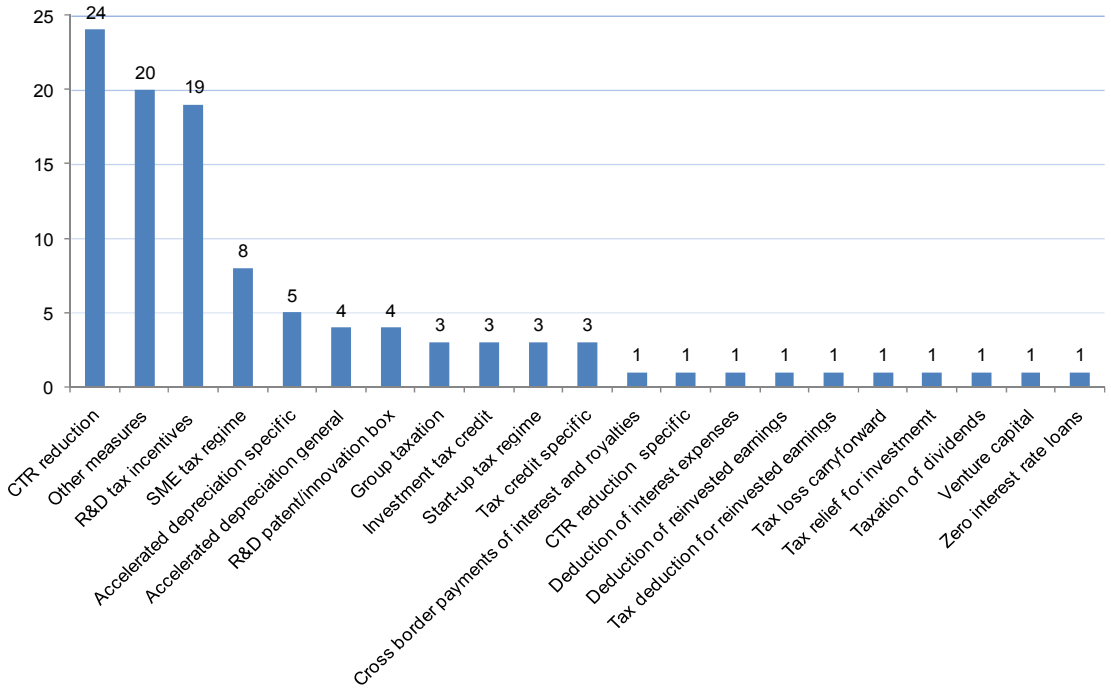
Figure 17 gives an overview of investment stimulating measures in the EU-28 countries. Figure 16 provides an overview of investment discouraging measures in the EU-28 countries. Figure 17 shows the number of investment stimulating and discouraging policy measures in the EU-28 countries by country. Reduction of the corporate tax rate is the main measure undertaken with 25 individual measures for the EU-28 member states in the period 2010 to 2015. Extensions or introductions of the R&D tax incentives are the second most used policy instrument (19 times). Extension of the SME taxation regime is ranked third with about eight actions. It is, however, not clear that the

benefits of preferential tax treatment of self-employed individuals and SMEs outweigh the costs of moving away from tax neutrality. Bonus or more generous depreciation methods are also important with nine individual actions, of which five are specific to target industries and four refer to investment in general. However, some bonus depreciation measures are only introduced on a temporary basis. Few actions are targeted to specific industries or activities (such as environmentally friendly investments). Investment credits are of minor use in the period 2010 to 2015. Countries with low economic growth (Greece and Spain) have undertaken more measures.

Austria has undertaken three investment stimulating and three investment discouraging measures between 2010 and 2015 (Figure 17). Investment stimulating measures include the following: (i) increase in tax allowance for unincorporated businesses (Steuernachlässe für Einzelunternehmen), (ii) removal of the loss carry-forward limit of 75 per cent (Abschaffung der Verlustausgleichsgrenze) and (iii) increase of the Research and Development tax credit from 10 to 12 per cent (Anhebung des F&E-Prämie von 10 auf 12 Prozent). Investment discouraging measures include (i) deductions for losses made in foreign subsidiaries being restricted in group taxation (Reduktion des steuerlichen Verlustausgleich bei Gruppenbesteuerung), (ii) abolition of the education premium and education tax allowance and limitation of refunds for contributions, and (iii) extension of non-deductibility of certain interest and royalty payments. The net effect on the corporate tax burden is difficult to calculate when there are each three stimulating and discouraging measures. In contrast, several EU countries (FI, IE, SI, the UK, DK and IT) have undertaken corporate tax reforms leading to a decrease in the corporate tax burden.

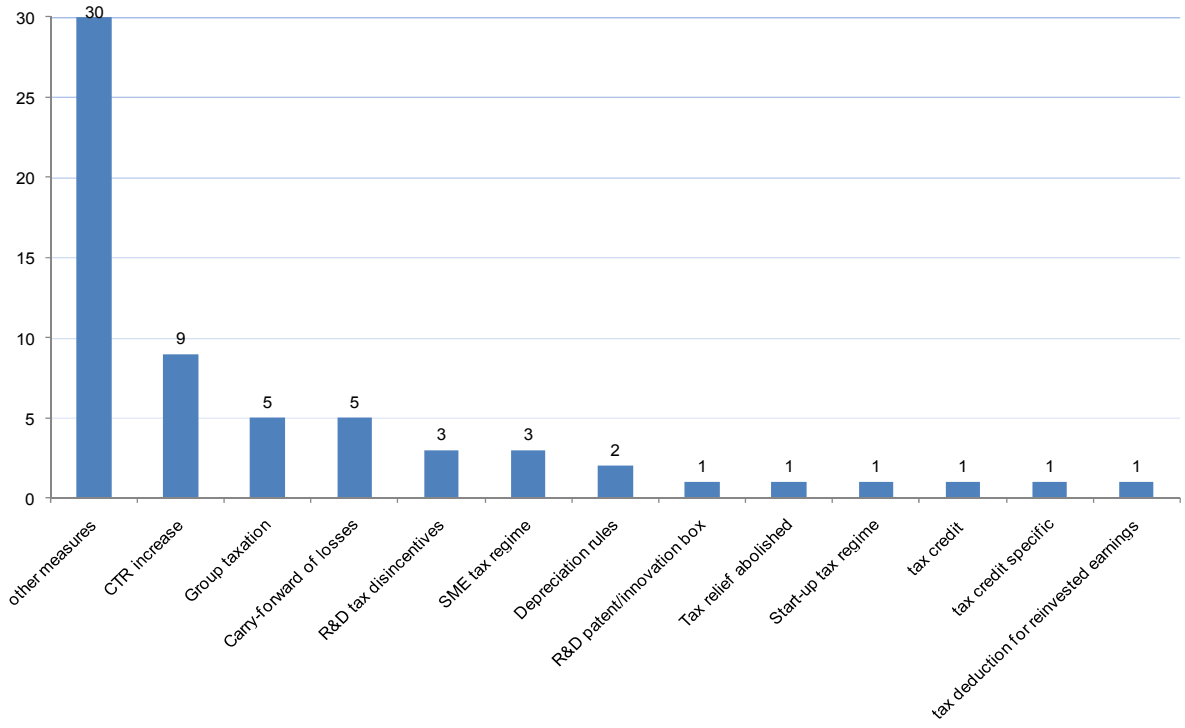
To sum up, new measures to stimulate investment include a bundle of support measures. The majority of investment relevant policy measures are related to reductions of the corporate tax burden.

Figure 15: Number of investment stimulating policy measures in the EU-28 countries between 2010 and 2015 by type



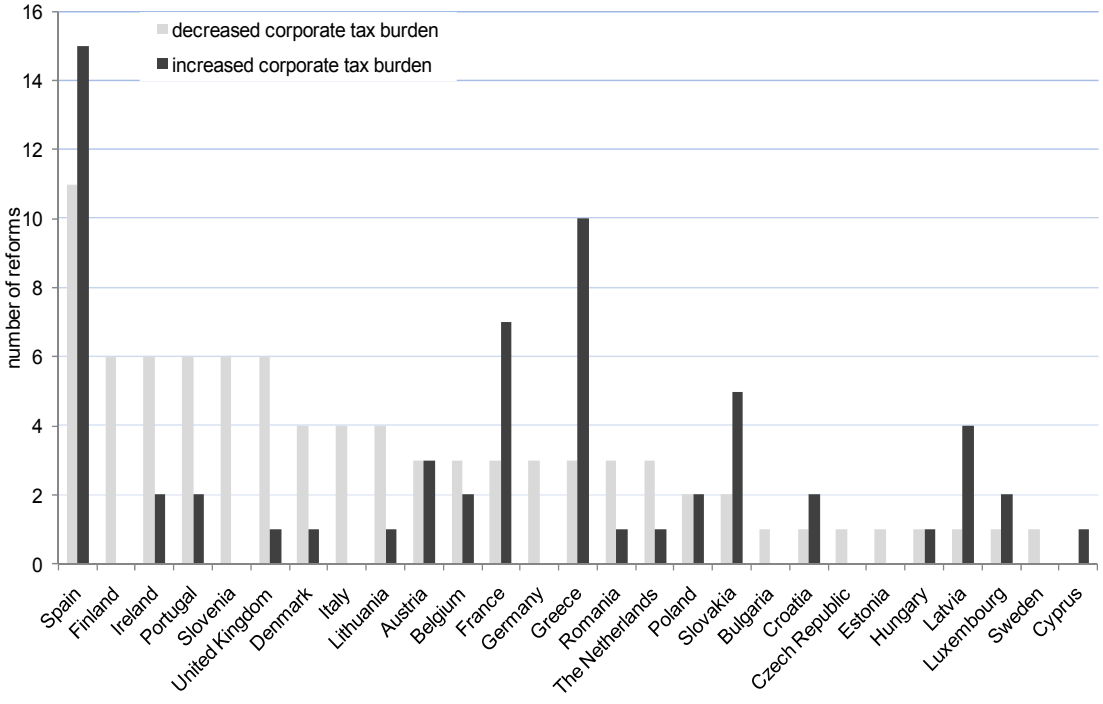
Source: European commission. Taxation_reforms_database

Figure 16: Number of discouraging investment policy measures in the EU-28 countries between 2010 and 2015 by type



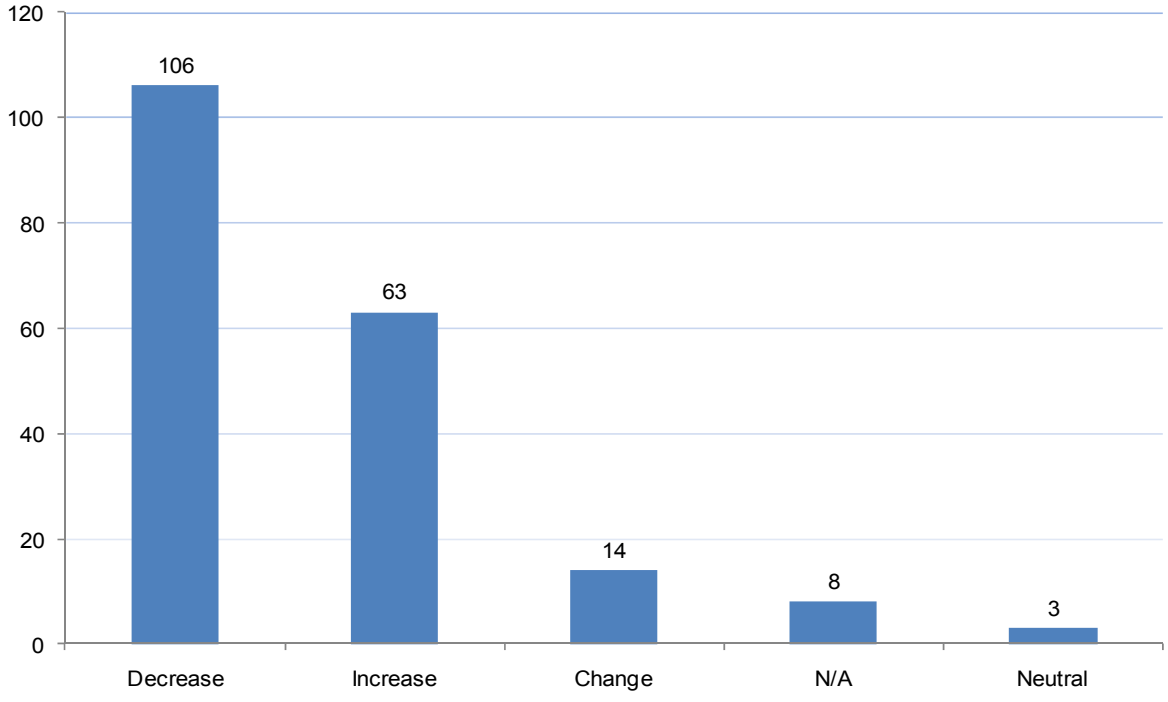
Source: European commission. Taxation_reforms_database

Figure 17: Number of investment stimulating and discouraging policy measures in the EU-28 countries between 2010 and 2015



Source: European commission. Taxation reforms database.

Figure 18: Investment relevant policy measures by expected effect on company taxation in the EU-28 countries between 2010 and 2015



Source: European commission. Taxation_reforms_database

In advanced EU countries, measures predominantly focus on reductions in the corporate tax rate and innovation policies while the countries with lower than average GDP per capita use reliefs or allowances to stimulate investment. Reductions in corporate tax rates are often combined with a broadening of tax bases. This seems to be seen as desirable in order to reduce the distortionary effects of corporate taxation on investments. For instance, in Germany the 2008 corporate tax reform, which involved a reduction of the CTR, was accompanied by several measures to broaden the tax base. Another important recent development in corporate taxation is the emergence of patent box regimes or intellectual property (IP) box regimes. Such regimes are targeted at income derived from intellectual property (Evers, Miller and Spengel, 2014). The measure provides either a reduced tax rate or a partial exemption of tax for the income generated from patents.

Tables 10 and 11 provide an overview of countries with existing patent box regimes and the corresponding effective tax rates. In 2014, 12 European countries have an Intellectual Property (IP) Box regimes that provided substantially reduced rates of corporate tax for income derived from important forms of intellectual property. Ireland in 1973 was the first country to introduce tax breaks for income from intangible assets (Klodt and Lang, 2016). The IP patent box was abolished after the financial crisis in 2010 but was re-introduced in 2016 as a "knowledge box". France introduced a patent box regime in 2000 and 2003 (Evers, Miller and Spengel, 2014). IP boxes received widespread public attention when introduced by the Netherlands and Luxembourg in 2007. Since then these patent box regimes have been made more generous and eight other European countries, including most recently, Portugal, have implemented their own versions. China operates a similar policy, and legislation for a United States (US) version has been submitted to the US Congress (Evers, Miller and Spengel, 2014). Table 10 shows that IP Box regimes can result in large reductions in effective average tax rates.

Table 10: Presence of patent box/intellectual property regime in Europe in 2014

country	year of introduction	IP Box rate	main CTR rate	difference	treatment of current expenses
Belgium	2007-	6.8	34.0	27.2	Gross income
Cyprus	2012-	2.5	12.5	10.0	Net income
France	2000-	16.7	35.4	18.7	Net income
Hungary	2003-	9.5	19.0	9.5	Gross income
Ireland	1973-2010	0.0	12.5	12.5	
Liechtenstein	2011-			0.0	
Luxembourg	2008-	5.8	29.2	23.4	Net income
Malta	2010-	0.0	35.0	35.0	n.a.
Netherlands	2007-	5.0	25.0	20.0	Net income
Portugal	2014-	15.0	30.0	15.0	Gross income
Spain	2008-	12.0	30.0	18.0	Net income
Switzerland	2011-	8.8	12.7	3.9	Net income
Turkey	2015-	10.0	20.0	10.0	
United Kingdom	2013-	10.0	21.0	11.0	Net income
Italy	2015-	15.7	31.4	15.7	n.a.

Source: Evers, L., Miller, H., & Spengel, C. (2014). European Commission (2014). Ernst and Young (2015).

This effect stems not only from low IP Box rates but also from the treatment of related expenses. The general expectation is that IP Boxes increase the incentive to innovate and make countries more attractive locations for production of intellectual property products. Existing patent boxes differ widely with respect to definition of the income basis and type of intangible assets (Table 11).

For instance, Liechtenstein, Luxembourg, Spain and Cyprus include not only profits from patents but also those from designs, copyright or trademarks. The patent/IP box regime of Hungary and Cyprus is even more generous and include revenues from economic expertise (Klodt and Lang, 2016). Belgium and Luxembourg offer an exemption of 80 per cent of profits from tax liability while Spain offers 50 per cent.

Table 11: Detailed comparison of patent box regimes

	Belgium	*China*	*France*	*Hungary*	*Luxembourg*	*Netherlands*	*Spain*	*United Kingdom*
Headline tax rate	6.80%	0-12.5%	15%	9.50%	5.84%	5%	12%	10%
Year Enacted	2007	2008	2001, 2005, 2010	2012	2008	2007, 2010	2008, 2013	2013
Qualified IP	Patents and extended patent certificates	Patents and know how	Patents, extended patent certificates, patentable inventions and industrial fabrication processes	Patent, know-how, trademarks, business names, business secrets, and copyrights	Patents, trademarks, designs, domain names, models, and software copyrights	Patents and IP derived from technological R&D activities	Patents, secret formulas, processes, plans, models, designs, and know-how	Patents, supplementary protection certificates, regulatory data protection, and plant variety rights
Applicable to existing IP?	IP granted or first used on or after 01/01/2007	n.a.	Yes	Yes	IP developed or acquired after 31/12/2007	IP after 31/12/2006	Yes	Yes
Applicable to acquired IP?	Yes, if further developed	Yes	Yes, subject to specific conditions	Yes	Yes, from non-directly associated companies	Yes, if further self-developed	No	Yes, if further developed and actively managed
Includes embedded royalties?	Yes	n.a.	No	No	Yes	Yes	No	Yes
Can R&D be performed abroad?	Yes, if qualifying R&D centre	No	Yes	Yes	Yes	Yes, for patented IP; strict conditions for R&D IP	Yes, but must be self-developed by the licensor	Yes
Qualifying income	Patent income less cost of acquired IP	Net income from qualifying IP	Royalties net of cost of managing IP	Royalties	Royalties and embedded royalties	Net income from qualifying IP	Net income from qualifying IP	Net income from qualifying IP
Includes sale on qualified IP?	No	n.a.	Yes	Yes	Yes	Yes	Yes	Yes
Is there a cap on the benefit?	Deduction limited to 100% of pre-tax income	Deduction limited to 5 million RMB, then half the corporate tax rate		Deduction limited to 50% of pre-tax income				

Source: Adapted from Atkinson and Andes (2011) and PWC (2013).

In Malta effectively no taxes on income on intellectual property have to be paid. In France there is a relatively high tax rate on profits from intellectual property with an effective rate of about 16.76 per cent (see Evers et al., 2014). Italy has introduced a similar model in 2015. The patent box in Belgium, Luxembourg and Malta is one of the more attractive ones (Evers et al., 2014; Klodt and Lang 2016). In September 2014 Germany considered introduction of a patent box with a reduced rate of 10 to 15% on profits from patents provided that they are obtained from domestic research and development

activities (Klodt and Lang, 2016). However the proposal was not approved by the Federal States of Germany and the decision to introduce the patent/IP box regime was delayed until the end of the OECD BEPS consultation process and in the meantime abolished. Recently, Italy introduced a patent box regime. A particular feature of the patent box regime is its wide range of qualifying intangibles (see Box 1).

For multinational firms, a patent box is a way to lower their tax burden. Using transfer pricing policies, revenues can be lowered in high-tax countries and thus less and fewer taxes have to be paid (Fuest et al., 2013). In some cases the income generated from intellectual property products does not have to take place necessarily where the patent is registered and where the gains arise. However, the OECD (2015) has changed the guidelines and suggests that the income should come from domestic R&D or production activities. The Italian patent box regime introduced in 2015 follows the OECD guidelines, and the UK patent box was adjusted accordingly after interventions from other EU countries.

Box 1 Definition of intangible assets in the Italian patent box regime

Industrial patents, biotech inventions, utility models, patents for plant varieties and semiconductors' topographies

Business, commercial, industrial and scientific information and know-how which can be held as secret and whose protection can be legally enforced

Formulas and processes

Designs and models, legally protected

Software protected by copyright

Trademarks, including collective trademarks, either registered or in the process of registration

http://www.mwe.com/The-Upcoming-Implementation-of-the-Italian-Patent-Box-Regime-07-31-2015/

There are several advantages and disadvantages of the patent/IP box regime (see Box 2). Justification for public intervention in intangible assets or intellectual property products is the same as for R&D investment or innovation

activities. It is well known that innovative activities of private companies are a key contributor to economic growth. R&D activities produce social benefits that are larger than private benefits. Thus R&D activities have positive externalities or positive spillover effects. Because of the spillover effects firms tend to under invest in R&D activities. They spend less than would be socially optimal. This leads to so-called market failure and provides a rationale for government intervention to raise R&D expenditure to a socially optimal level. Principal instruments are R&D tax incentives and direct R&D grants, or investment support for innovative equipment. The positive externalities are likely to hold true for investment in intellectual property products.

Box 2: Potential benefits and costs of a patent box

Potential benefit of the patent box

- Prevent domestic firms to relocate intellectual property abroad for the sole purpose of tax avoidance>effect likely to be low
- Additional incentives to innovate- >effect likely to be low given the high level of R&D subsidies in Austria
- Increase in the incentives to patent->likely to be high
- Lower tax rate will ultimately increase post-tax profits of innovative firms

Potential costs of the patent box

- Decrease in corporate tax revenues from the population of patenting firms
- High administrative costs for tax administration
- Increase in the complexity of the tax system

Source: Adopted from de Rassenfosse (2015).

Patent box regimes have been criticized because they undermine attempts of ongoing international tax system reform aimed at tackling tax avoidance (OECD Base Erosion and Profit Shifting initiative). The OECD has suggested the so-called nexus approach in which tax concessions should be subject to patents generated from research activities conducted in the home country (domestic R&D). This means that substantial R&D activity has to be performed in one's own country rather than abroad (Klodt and Lang, 2016).

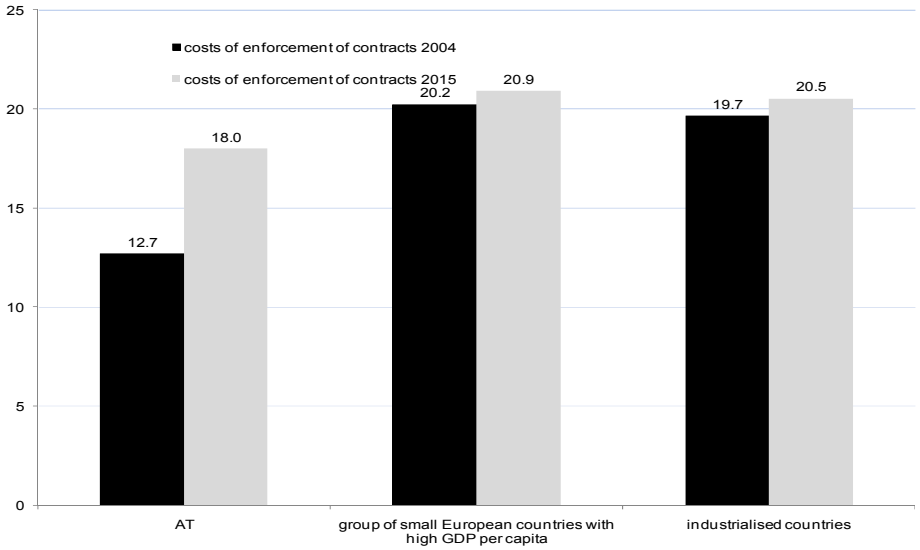
Starting in 2016, new patent boxes have to be in line with the BEPS Initiative. This means that tax relief on profits from patents only holds when patents are

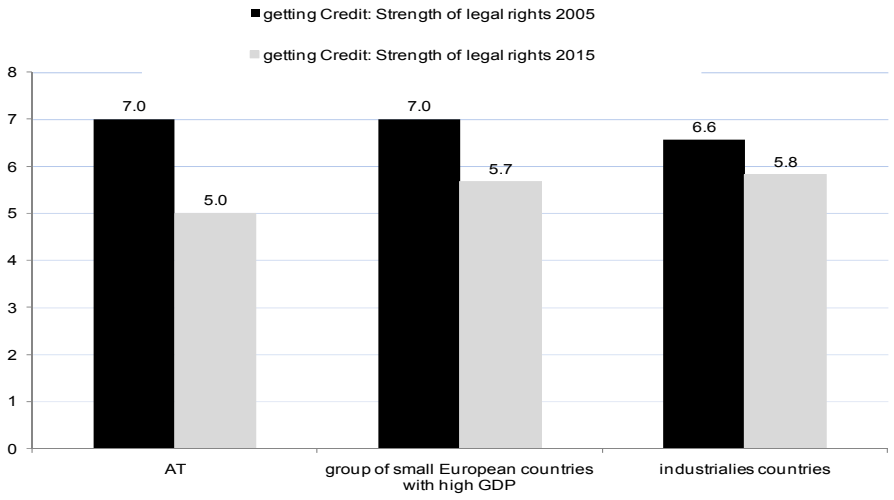
invented from domestic research and development activities. Italy has accordingly already designed its newly introduced patent box. Ireland is currently introducing a so-called Knowledge Development tax box that should be compatible with OECD guidelines. Existing patent boxes have to be modified accordingly by 2020 (Klodt and Lang, 2016).

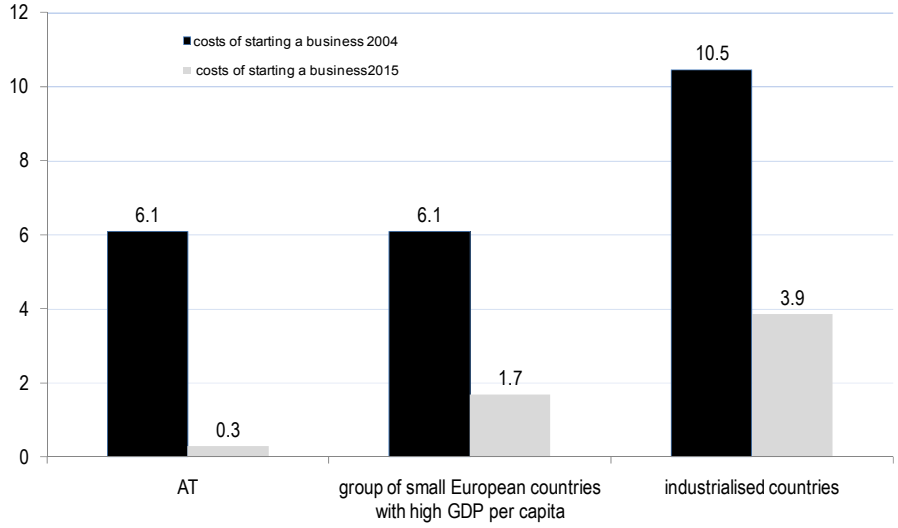
After having investigated the corporate tax regime, this section looks at selected business climate factors and access to finance. Access to finance and investment climate factors are also important determinants of the investment decision and the amount of investment. Evidence from WIFO-Konjunkturtest data shows that access to finance has improved over the last years. This particularly holds true for firms with a loan agreement in the last three months. In this group the percentage of firms who regard bank lending as restrictive has steadily declined from 2011 onwards (from 47 per cent to 37 per cent) (Figure 20). Long term Interest rates have declined to a historically low level (with a loan interest rate of 1.6 per cent). However, interest rates are becoming less and less relevant for the investment decision.

Different types of business and investment climate factors have developed highly uneven over time. While there is strong decline in the costs of starting a business, other business climate factors have increased in the last years (e.g. costs of enforcement of contracts, strength of legal rights for obtaining credit) (Figure 19). The deterioration of these business climate factors is more pronounced in Austria than in the group of comparable EU countries.

Figure 19: Investment climate factors

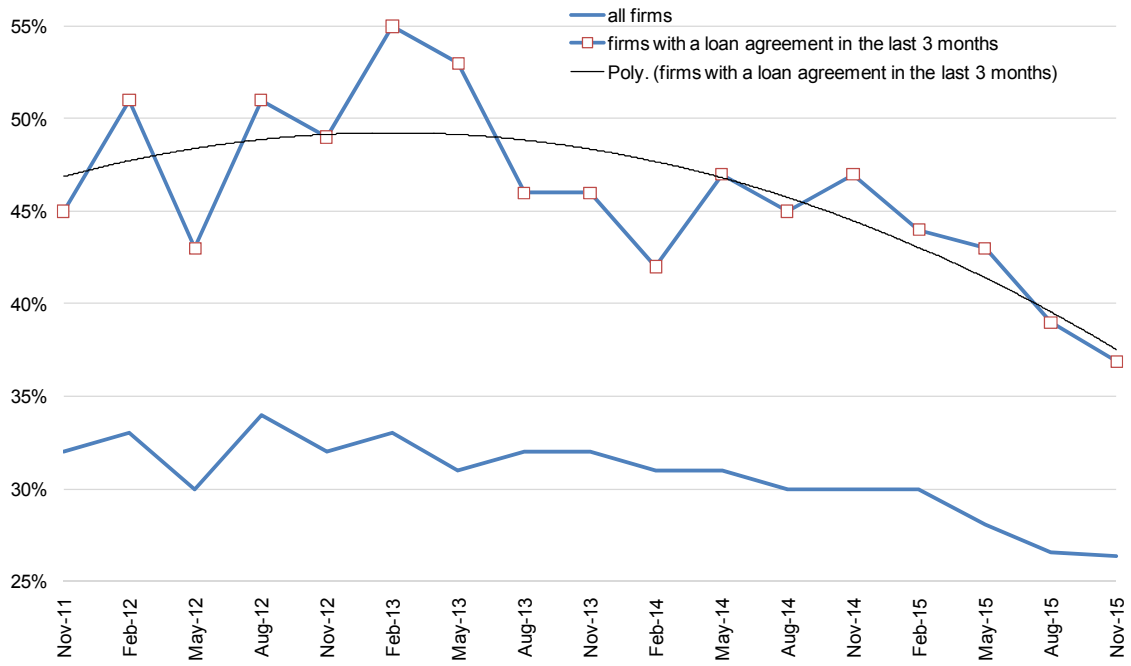






Source: World Bank doing a business database.

Figure 20: Percentage of companies who regard bank lending as "restrictive "



Source: WIFO-Investitionstest.

4 Contribution of capital stock to value added growth

This chapter investigates the contribution of the capital input to growth of value added. The latest available studies are related to the period before the financial and economic crisis of 2008 (Kegels, Peneder & van der Weil, 2012). The growth accounting framework is one of the most widely used methods to understand the growth contributions of the different input factors. We start by decomposing value added growth ($\Delta lnVACP_i$) into the contribution of capital (CONTK) and labour (CONTL) defined as follows:

$$CONTL = \frac{WH}{COST}\Delta \ln L_i$$

$$CONTK = \frac{INV}{COST}\Delta ln K_i ,$$

where WH denotes the total wage bill, L is measured as total working hours or number of full time workers, INV is gross fixed capital formation and K is capital

services in constant prices (capital stock in nominal prices deflated by a price index with a given base year). COST denotes the production costs approximated by the sum of total wage bill and gross fixed capital formation. Growth of real value added is then decomposed in the contribution of capital and labour:

$$\Delta lnVACP_i = \frac{WH}{COST}\Delta ln\, L_i + \frac{INV}{COST}\Delta ln\, K_i + \Delta RES\ ,$$

where RES is the residual (=total factor productivity). In the next step we decompose real value added growth by growth of labour and that of the three different types of capital:

$$\Delta \ln VACP_i = \frac{WH}{COST}\Delta \ln L_i + \frac{INV^S}{COST}\Delta \ln K_i^S + \frac{INV^E}{COST}\Delta \ln K_i^E + \frac{INV^{IPP}}{COST}\Delta \ln K_i^{IPP} + \Delta RES\ ,$$

where K^S, K^E and K^{IPP} denote real fixed assets in structures, equipment and intellectual property products, respectively. We do not account for the quality of labour (skills) because wages by educational attainment are not available. Table 12 shows the results of the growth accounting calculations for the aggregate capital stock for selected industries for the period 2002 to 2010.

Table 12: Contribution of capital and employment to value added growth 2002-2010

	contribution to real value added growth						
	K	L	res	Y	K	L	res
	growth contribution in percentage points				growth contribution in per cent		
		2002-2010				2002-2010	
15t37	0.5	-0.1	2.2	2.6	19.0	-5.1	86.1
23a4	3.9	0.8	9.0	13.7	28.5	5.8	65.7
29t33	-0.1	0.5	3.2	3.6	-4.2	13.9	90.3
50t74	0.1	1.1	2.5	3.7	2.8	29.5	67.7
71t4	0.6	2.9	0.2	3.7	16.2	78.5	5.3
TOT	0.3	0.8	2.3	3.4	9.5	22.9	67.6
		2002-2008				2002-2008	
15t37	0.6	0.4	2.5	3.5	17.8	10.3	71.9
23a4	3.4	0.8	6.4	10.6	32.4	7.7	59.9
29t33	0.1	0.8	3.8	4.7	1.2	17.2	81.5
50t74	0.2	1.2	2.0	3.4	6.3	35.3	58.4
71t4	0.6	3.0	-0.1	3.6	18.0	84.6	-2.5
TOT	0.4	1.0	2.1	3.5	12.5	28.9	58.6

Notes: K denotes the capital stock, L is Employment in full-time equivalents, Y is real value added and res is the residual. Source: ESSLAIT MMD moments database based on Statistics Austria data.

The results show that growth of capital stock accounts for 19 per cent of value added growth in manufacturing, and 16 per cent in business services.

In manufacturing, productivity growth (residual) accounts for the largest part of real value added growth (84 per cent or 2.2 percentage points per year on average). The high importance of total factor productivity growth indicates that factors other than labour and capital, such as intangible inputs, R&D expenditure and other innovative activities, are main drivers of growth.

Therefore, in the next stage we distinguish by different types of assets. Table 13 shows the contribution of different types of capital and the residual total factor productivity (TFP) to growth of real value added for the Austrian economy by broad industry groups.

Table 13: Contribution of capital and employment to value added growth in Austria 2005-2014 (in percentage points)

	RVA	hours	capital				TFP
				structures	equip-ment	IPP	
				2010-2014			
Total - All NACE activities	1.1	0.3	0.5	0.1	0.1	0.3	0.3
Industry (except construction)	2.4	0.3	1.1	0.0	0.3	0.7	1.0
Manufacturing	2.4	0.3	1.1	0.0	0.2	0.8	1.0
Construction	-1.4	0.2	0.2	0.0	0.1	0.1	-1.7
Wholesale, retail trade, transport, accommodation & food service activities	0.5	-0.1	0.3	0.1	0.0	0.2	0.3
Information and communication	0.9	2.6	0.4	0.0	-0.6	1.0	-2.1
Financial and insurance activities	-0.8	-1.0	0.3	0.0	0.1	0.2	-0.1
Real estate activities	2.4	0.1	1.4	1.4	0.0	0.0	0.8
Professional, scientific, technical activities, administrative, support service	2.9	2.1	1.0	0.1	0.6	0.4	-0.2
Arts, entertainment and recreation other service activities	0.4	0.7	0.1	0.0	0.1	0.0	-0.4
				2005-2008			
Total - All NACE activities	3.0	0.9	0.7	0.3	0.2	0.2	1.4
Industry (except construction)	3.9	0.5	0.8	0.1	0.2	0.6	2.6
Manufacturing	5.4	0.5	0.8	0.0	0.1	0.7	4.1
Construction	0.1	2.6	0.0	0.1	0.0	0.0	-2.6
Wholesale, retail trade, transport, accommodation & food service activities	1.9	0.7	0.6	0.3	0.0	0.3	0.6
Information and communication	2.9	0.1	0.7	0.0	-0.3	1.0	2.1
Financial and insurance activities	6.8	2.0	-0.3	0.0	-0.3	0.0	5.1
Real estate activities	2.5	0.2	2.0	1.8	0.2	0.0	0.3
Professional, scientific, technical activities, administrative, support services	6.3	4.3	2.7	0.3	2.1	0.3	-0.7
Arts, entertainment and recreation other service activities	1.8	0.7	0.2	0.0	0.2	0.0	0.9

Notes: TFP denotes total factor productivity; IPP denotes intellectual property products. Source: Eurostat , national accounts.

Results are reported for two sub periods: (i) 2005 to 2008 and (ii) 2010 to 2014. This makes it possible to compare the results before and after the economic crisis with each other.

For the total economy between 2010 and 2014 the contribution of capital to growth of value added in constant price is 0.5 percentage points per year on average whereas the contribution of labour and TFP is 0.3 percentage points each. This indicates that capital accumulation plays the largest role in determining growth of real value added.

When capital is disaggregated into different types, the results show that assets related to intellectual property products exhibit one of the highest contributions to economic growth among all input factors (together with the labour input). Between 2010 and 2014 the growth contribution was 0.3 per year on average. The contribution of intellectual property products is highest in manufacturing (0.8 percentage points), information and communication services (1.0 percentage point), and professional, scientific and technical activities including administrative and support service activities (0.4 percentage points). This is primarily due to the strong growth of this type of asset over the period 2010 to 2014. It also reflects the relatively high share of investment in intellectual property. This is another key finding of the study. In advanced economies, such as Austria, intangible assets (or intellectual property products) are the main factor influencing growth and competitiveness rather than equipment capital or structures. For instance, for the total economy the contribution of equipment and structures is each 0.1 percentage points per year. For manufacturing as well as professional and technical services the results show that assets in equipment have a higher contribution to value added growth with about 0.2 and 0.6 percentage points per year on average. However, in the majority of industries the growth contribution of assets in intellectual property products exceeds that of equipment assets. TFP contributes 0.3 percentage points to labour productivity growth with the highest contribution in manufacturing. TFP growth

reflects all factors that are not captured by capital accumulation and growth of labour input. Previous studies using the growth accounting framework for industrialized countries also find that intangible assets are one of the most important determinants of productivity and output growth (Jalava et al., 2007 for Finland; Marrano, Haskel and Wallis 2009 and Dal Borgo et al., 2012 for the UK; Edquist, 2011 for Sweden; Van Ark et al., 2009 for the EU countries, Corrado et al., 2012 for selected OECD countries). Furthermore, the authors find that the contribution of intangibles to productivity growth is larger or only slightly lower than that of equipment and structures (Corrado et al., 2012; Van Ark et al., 2009). Econometric studies based on country level data (Roth and Thum, 2013) and regional data (Melachroinos and Spence, 2012) find similar results. Using macroeconomic data for 13 EU countries for the period of 1998 to 2005, Roth and Thum (2013) find that intangible assets, defined as investment computerized information, innovative property and economic competences, explain 50 per cent of labour productivity growth.

There are several reasons for how different types of intangible assets affect the output and productivity of firms (Table 14). Use of Intangible assets has many different positive effects within firms. For instance, intangible assets lower transaction costs, lead to vertical integration, create new products and services, and enable innovation in general.

The next step is investigate the benefits companies have derived from intangible asset investments. The European Commission survey on intangible assets conducted in 2013 comprises a question on whether or not and to what extent a given company's investment in intangible assets has benefited the company in a range of areas distinguished by (i) sales, (ii) profit margin, (iii) skills and qualifications of employees, (iv) market share, and (v) overall value of the company.

Table 14: Possible effects of different types of intangible assets on output and productivity growth

Computerised information	**Possible effect on output growth**
Software	Improved process efficiency, ability to spread process innovation more quickly, and improved vertical and horizontal integration.
Databases	Better understanding of customer needs and increased ability to tailor products and services to meet them. Optimised vertical and horizontal integration
Innovative property	
Research and development (R&D)	New products, services and processes, and quality improvements to existing ones. New technologies
Mineral exploration	Information to locate and access new resource inputs – possibly at lower cost – for future exploitation.
Copyright and creative assets	Artistic originals, designs and other creative assets for future licensing, reproduction or performance. Diffusion of inventions and innovative methods.
New product development in financial services	More accessible capital markets. Reduced information asymmetry and monitoring costs.
New architectural and engineering designs	New designs leading to output in future periods. Product and service quality improvements, novel designs and enhanced processes.
Economic competencies	
Brand-building advertising	Improved consumer trust, enabling innovation, price premia, increased market share and communication of quality.
Market research	Better understanding of specific consumer needs and ability to tailor products and services.

Source: Source: Van Ark et al. (2009) and OECD (2013) cited in Weiss (2015).

Table 15: Has previous investment in intangible assets benefited your company?

	A lot	Some	Little	None	DK/NA
			Austria		
Sales	20	37	18	16	10
Profit margin	14	32	19	22	14
Skills and qualifications of employees	38	33	9	11	10
Market share	23	26	18	20	13
Overall value of the company	25	34	14	16	11
			EU-6		
Sales	14	40	18	20	8
Profit margin	9	33	21	27	10
Skills and qualifications of employees	21	35	12	22	10
Market share	8	34	20	29	10
Overall value of the company	11	40	19	21	10

Notes: EU-6 countries include BE - Belgium NL - The Netherlands DK – Denmark, IE - Ireland FI - Finland SE – Sweden.

Source: *European Commission, Brussels (2014): Flash Eurobarometer 369 (Investing in Intangibles: Economic Assets and Innovation Drivers for Growth).*

In Austria the skills and qualifications of employees benefit most from investment in intangible assets. In particular, 38 per cent of companies answer that the firm has benefited 'a lot' in terms of skills and qualifications, while 33 per cent answer that the firm received 'some' benefit (Table 15). The corresponding number for the EU-6 countries is 21 and 35 per cent. In addition market share and sales are also positively influenced by investment in intangible assets. In Austria 57 per cent of firms say there is 'a lot' or 'some'

benefit with respect to sales, and 49 per cent see 'some' or 'a lot' of benefit for the market share.

5 Empirical analysis of factors influencing investment behaviour

In order to formulate an effective policy strategy to stimulate investment, a detailed empirical analysis is required on the factors that influence investment behaviour. As stated above the investment decision depends on output change and changes in the price of capital (change in corporate tax rate, change in depreciation regime, introduction of other support measures). This section investigates the determinants of capital accumulation measured as change in capital stocks using two digit industry data for Austria and selected EU countries including both services and manufacturing. Special focus is on investigation of whether capital accumulation is influenced by investment support measures. We distinguish between three different measures: (i) incremental investment tax credit from 2002 to 2004, (ii) accelerated depreciation from 2009 to 2010 and (iii) reduction in the corporate income tax rate between 2005 and 2010.

Box 3: Previous main investment support measures in Austria

Investitionszuwachsprämie 2002-2004

The incremental investment tax premium was a temporary investment tax credit equal to 10% of the growth of corporate investment growth for the current calendar year as compared to the average amount of investment for the three previous financial years (e.g. 2002 as compared to 1999 through 2001). The investment premium was both limited to the calendar years 2002 to 2004 as well as to investment of certain assets. Many asset types were excluded from this tax advantage (building, low-value assets, certain vehicles) Source: § 108e EStG.

Vorzeitige Abschreibung 2009-2010

An accelerated depreciation of maximum 30% of the acquisition physical assets is offered for 2009 and 2010. Excluded from the bonus depreciation are building and construction, further vehicles and small vans (excluding driving school vehicles and taxis), aircraft and low-value assets.

In order to gain first insights into the possible effects of the incremental tax credit and bonus depreciation, we compare equipment investment rates

before the introduction of the support measure and in the last year of the measure.

The results at the industry level show that during the bonus depreciation regime there was an increase in the share of equipment investment (+0.4 percentage points). In contrast, in the comparison group the equipment investment ratio declined by 0.4 per cent (Table 16). However, for the remaining industries the results are mixed. In information and communication services the investment ratio declined during the bonus depreciation regime. The negative effect is not surprising since equipment investment does not play a major role in this industry. Positive effects can also be observed for professional services. Here the decline is a bit less pronounced than in the control group. Furthermore, the bonus deprecation regime seems to have no influence on investment behaviour in wholesale and retail trade.

Table 16: Ratio of equipment investment to value added before and after the introduction in per cent

	Industry (except construction)								
					change				change
	2001	2002	2003	2004	2004/2001	2008	2009	2010	2010/2008
AT	12.8	11.4	11.8	10.3	-2.5	10.7	11.8	11.1	0.4
EU-27	13.4	13.5	14.0	13.3	0.0	15.1	12.2	11.4	-3.6
EU-4	10.3	10.3	10.0	9.6	-0.7	10.4	10.7	8.6	-1.7
	Wholesale and retail trade, transport, accomodation and food service activities								
					change				change
	2001	2002	2003	2004	2004/2001	2008	2009	2010	2010/2008
AT	9.0	8.3	8.0	7.5	-1.5	7.5	7.1	6.4	-1.1
EU-27	11.5	9.7	10.5	10.4	-1.1	11.5	9.2	9.4	-2.1
EU-4	7.7	7.4	7.8	8.2	0.4	8.4	10.9	10.2	1.8
	Information and communication								
					change				change
	2001	2002	2003	2004	2004/2001	2008	2009	2010	2010/2008
AT	27.6	20.3	17.4	17.0	-10.6	16.2	14.5	4.6	-11.6
EU-27	19.1	17.3	13.9	14.8	-4.3	12.2	10.0	10.6	-1.6
EU-4	13.5	8.7	7.2	7.5	-6.0	7.2	6.0	6.3	-1.0
	Professional, scientific and technical activities; administrative and support service activities								
					change				change
	2001	2002	2003	2004	2004/2001	2008	2009	2010	2010/2008
AT	22.1	23.3	26.8	29.5	7.4	24.0	18.9	21.6	-2.4
EU-27	12.1	10.6	12.4	11.9	-0.1	11.3	8.3	8.4	-2.9
EU-4	13.1	11.6	11.2	12.0	-1.1	11.2	5.7	6.3	-4.9

Source: National accounts. Eurostat .

The incremental investment tax seems to have a positive influence in professional services which are dominated by micro enterprises and SMEs. For professional services, equipment investment increased strongly before the introduction of the measure and in the last year of the measure (+7.4

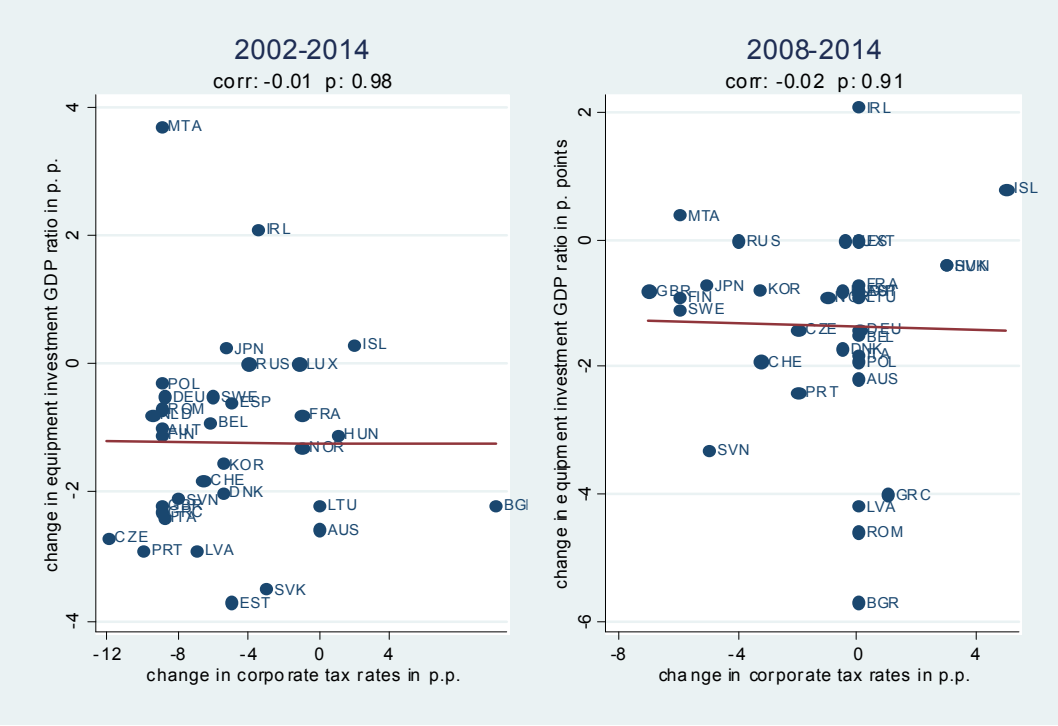
percentage points). The possible effect in this industry is not surprising. Business services are dominated by small firms with often erratic investment behaviour.

For these firms it was too difficult to lift investment over the threshold of the last three years before the introduction of the survey. In manufacturing, the introduction of the incremental investment tax credit between 2002 and 2004 could not prevent the reduction of investment.

The next step is to analyse the impact of the change in corporate taxes on investment behaviour. Corporate taxes are likely to stimulate not only foreign direct investment but also domestic investment demand. As outlined above, in the EU-28 countries, there is a high degree of variation in corporate taxes with the highest tax rates in Italy, France and Belgium, and lowest in Ireland and the Baltic States. Recall that there is a general downward trend in corporate tax rates of about seven percentage points between 2002 and 2014 (unweighted across EU countries). Despite the decrease in corporate taxes, in the majority countries the change in the ratio of equipment machinery to GDP is decreasing. The decrease is most pronounced in Romania and Bulgaria with both countries having started at a high investment ratio at the beginning of the period. This already indicates that corporate taxes may only play a minor role in stimulating investment. Figure 21 reports the correlation coefficients and the significance levels between the change in corporate tax rates and the change in investment in machinery investment for two time periods: 2002 to 2014 and 2008 to 2014. The sample consists of 33 countries of which 27 are EU member states. Correlation coefficients for the two time periods are close to zero and not significant (r=-0.01 and -0.02). This indicates that the decline in the corporate tax rate has not led to an increase in the ratio of machinery and equipment investment to GDP. When the level of corporate tax rate is considered instead of its change, we again find no correlation with the change in equipment investment to GDP ratio (Figure 22). This indicates that countries with a high corporate tax do not have a stronger decline in the equipment investment ratio. However, there is significant and

positive correlation between the level of the corporate tax rate and the level of the ratio of equipment investment to GDP in a given year (Figure 22). This means that the lower the corporate tax rate, the higher the investment ratio. However, this is a spurious correlation because in some Eastern European countries tax rates are low in order to attract foreign direct investment and to stimulate domestic investment. These countries are characterised by high capital productivity and a lower GDP per capita across the EU countries. In fact there is a strong negative correlation between the ratio of equipment investment to GDP and the GDP per capita ratio (r=-0.41 and p-value of 0.02) (Figure 23). Countries with a high share of equipment investment of 10 per cent or more such as Slovakia and the Czech Republic exhibit a lower than average GDP per capita (lower than 30,000 in current international USD). On the other hand, countries with a high GDP per capita, such as Norway, the Netherlands and the USA, have a low ratio of equipment investment ranging between five and seven per cent.

Figure 21: Relationship between change in corporate taxes and change in equipment investment

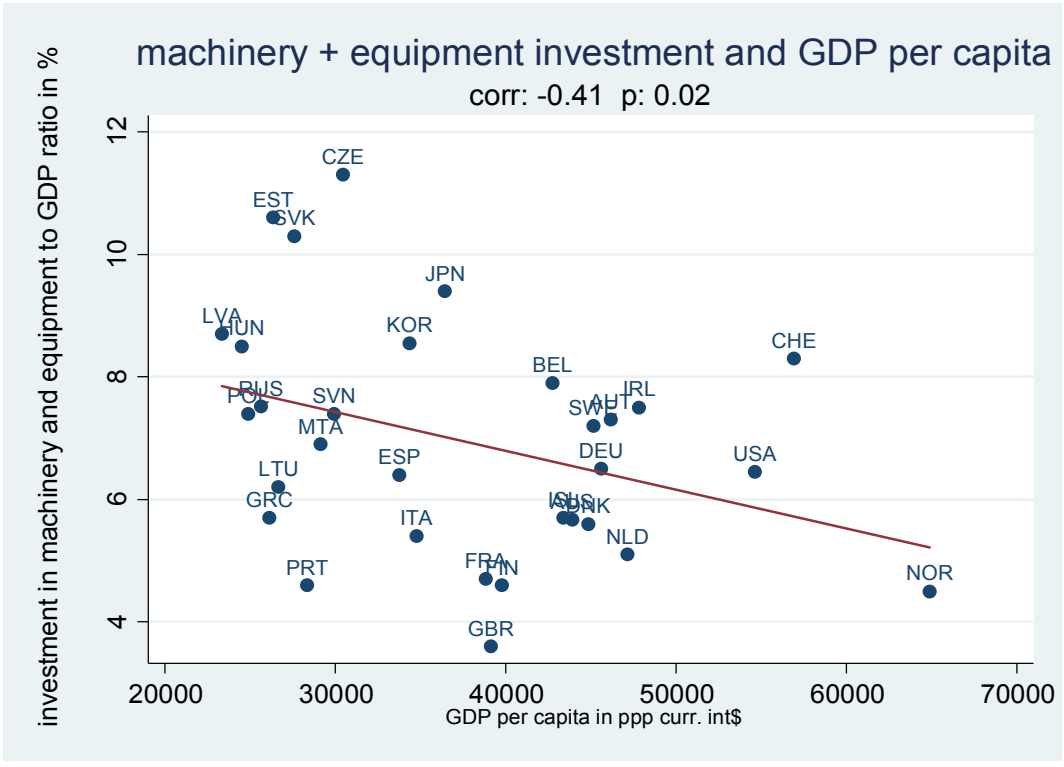


Source: OECD STATS, Eurostat , World Bank doing a business database

Figure 22: Relationship between level of corporate taxes and equipment investment

Source: OECD STATS, Eurostat , KPMG.

Figure 23: Investment in machinery and equipment, and GDP per capita



Source: OECD STATS, Eurostat , Word Bank development indicators.

Figure 24: Relationship between tax rate level and equipment investment

Source: OECD STATS, Eurostat , World Bank doing a business database.

As an alternative to the corporate tax rate, the total tax rate can be employed. The total tax rate consists of the labour tax rate, profit tax rate and other taxes. In Austria, the labour tax rate is about 34 per cent and close to the average of about 35 industrialized countries. The profit tax rate is 15 per cent and higher than the average. The remaining taxes are other taxes that do not play a role. When the total tax rate is employment instead of the corporate tax rate we surprisingly find a positive and significant relationship between change in the equipment investment ratio and change in the total tax rate (Figure 24). This means the higher the increase in the tax rate, the higher the change in the ratio of equipment investment to GDP. Examples of countries that have significantly increased their tax rate include Estonia, Ireland, South Korea, Iceland and Switzerland. Overall, the bivariate relationships at the aggregate level show that equipment investment is rather independent to changes in the total tax rate or corporate tax rate. These findings are quite surprising and contrary to expectations. However, given the

aggregate nature and the short time period, one should be careful to draw conclusions.

Next we use a multivariate model to investigate the relationship between corporate taxes and investment behaviour. Following the literature we assume that the capital stock is a function of the price of capital and output. Ideally the price of capital should be measured as the user cost of capital. This consists of the real price of capital goods, the depreciation rate, corporate tax rate and the expected real interest rate. Detailed information on price of capital goods across industries and countries however is not available in the database. Therefore, we assume that the effects of user cost of capital can be approximated by time trend. The price of capital is approximated by the interest rate of government bonds and by the corporate tax rate (measured as the EATR or statutory CTR). Assuming a log linear form and adding an error term leads to the following static capital stock function:

$$\ln K_{ict} = \beta_{ic} + \beta_1 EATR_{ict} + \beta_2 IR_{ict} + \beta_3 \ln VACP_{ict} + \varepsilon_{ict}$$

where *i, c,* and *t* denote the industry, country, and year, respectively. K denotes the capital stock in constant prices, EATR is the effective average tax rate, IR is the long term interest rate and VACP is value added in constant prices. Instead of the effective average tax rate, the statutory tax rate can be employed. It is often argued that statutory corporate rates are not an accurate measure of the effective tax burden. De Mooij and Ederveen, (2003) suggest that the effective average tax rate (EATR) is a more appropriate measure of the tax burden since it captures many details of the tax system such as possible tax exemptions. Further, β_{ic} is the fixed (group) effect and ε is the error term with mean zero and assumed i.i.d. Taking the long difference specification and adding a set of dummy variables and the time trend leads to the following short-run investment demand function:

$$\Delta \ln K_{ict} = \beta_0 + \beta_1 \ln \Delta EATR_{ict} + \beta_2 \Delta IR_{ict} + \beta_3 \Delta \ln VACP_{ict}$$
$$+ \beta_3 \Delta BROADPCT_{ict} + \beta_4 t + D2009/10 + \mu_{ic}$$

where t is the time trend and $D2009/10$ is a dummy variable equal to one for the recession year 2009 and the following year. Δ is the first-difference operator so that $\Delta \ln K_{ict}$ measures new investment. In addition, a measure of digitalisation is introduced, i.e. the share of employees with broadband internet access ($\Delta BROADPCT_{ict}$). It is likely that the rapid use of broadband internet leads to an increase in complementary assets. The new error term is defined as follows: $u_{ic} \equiv \varepsilon_{ict} - \varepsilon_{ict-1}$, with zero mean and constant variance.

The investment demand equation can be estimated by OLS with heteroscedasticity-consistent standard errors. Since OLS estimates based on first differenced data are likely to be sensitive to influential observations, the investment demand equation is estimated using the robust regression method. This regression technique is a weighted least-squares procedure that puts less weight on outliers. In order to allow for differences in the relationships across industries, we estimate the investment equation separately for manufacturing and services.

The data is based on the Micro Moments Database (available at EUROSTAT) which contains linked and micro-aggregated information on firms drawn from the national statistical offices in 12 European countries (Austria, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Sweden, Slovenia and the United Kingdom) for the period 2000 to 2010. The data is available at the two-digit industry level as well as for other dimensions. The capital stock is estimated by Statistics Austria using the perpetual inventory method based on sectoral deprecation rates. The industry classification is based on NACE rev 1.1 (15-37 and 50-74), exclusive of energy, water and construction, and contains information for the period 2000 to 2010. All series are adjusted for the change in industry classification from NACE rev 1.1 to NACE rev 2 starting from 2008 onwards. In particular, a concordance file based on a possible overlap of two industry classifications in a single year is used to change industry Nace 2 codes to Nace rev 1.1 level codes (at the

firm level) from 2008 onwards (Bartelsman et al., 2014). Table 17 shows robust regression estimates of the determinants of capital stock growth.

Table 17: Determinants of growth of real capital stock

	manufacturing					
	coeff		t		coeff		t
Δ.EATR	-0.471	**	-2.57	Δ.CTR	-0.386	**	-2.35
Δ.Bond yields	1.199		1.62	Δ.Bond yields	0.946		1.30
Δ.value added in cons. p.	0.177	***	9.01	Δ.value added in cons. p.	0.150	***	7.83
dummy 2009 and 2010	-0.015		-1.23	dummy 2009 and 2010	-0.029	**	-2.34
time trend	0.002		1.09	time trend	0.004	**	2.17
constant	-0.001		-0.13	constant	-0.013		-1.31
# obs	759			# obs	759		
	services						
	coeff		t		coeff		t
Δ.EATR	-1.105	***	-2.46	Δ.CTR	-0.722	*	-1.80
Δ.Bond yields	1.015		0.58	Δ.Bond yields	0.386		0.24
Δ.value added in cons. p.	0.259	***	5.01	Δ.value added in cons. p.	0.350	***	23.95
dummy 2009 and 2010	-0.024		-0.87	dummy 2009 and 2010	-0.031		-1.18
time trend	0.014	***	3.17	time trend	0.017	***	4.00
% broadband employees	0.203	***	2.64	% broadband employees	0.157	**	2.22
constant	-0.069	***	-2.71	constant	-0.088	***	-3.70
# obs	238			# obs	238		

Note: The dependent variable is the change in the real capital stock over the period 2002 to 2010. ***, **, and * denote significance at the 1, 5, and 10 per cent levels, respectively. The analysis is based on two digit industry data for eight countries (AT, DE, FI, FR, IT, NL, SE and the UK).

Separate results for manufacturing and services are provided. The main result is that changes in the effective average tax rate are significantly negatively related to the growth of the capital stock. This means that reductions in corporate taxes over the sample period have led to an increase in capital accumulation. Several countries in the sample have lowered their corporate tax rate during the sample period.

Furthermore, the coefficient of the corporate tax is also negatively statistically significant. The coefficients can be interpreted as short-run elasticities. For manufacturing, the estimated coefficient of -0.47 means that a reduction in the average tax rate by one percentage point leads to an increase in the capital stock by 0.5 percentage points given the impact of the control variables. Interestingly, the negative effects of the tax rates are higher in services than in manufacturing. This is a bit surprising since manufacturing is more capital intensive than services (except transportation and real estate). Note that the EATR has a larger effect than the CTR. Long-term interest rates

are not significantly related to the growth of capital stock. This indicates that the interest rate policy of the ECB has influence on the investment behaviour. Output measured as value added has the expected sign. However, elasticity is rather small.

Several robustness checks have been conducted. First, we also use changes in the tax rates lagged by one or two years. Unreported results confirm that the lagged changes are less significant indicating a fast reaction. Second, country specific estimations are conducted. Preliminary findings show that the tax effects differ across countries. However, given the small sample size for each country, one cannot draw strong conclusions.

To sum up, the main result of this section is that reductions in corporate tax rates stimulate investment. This finding is consistent for both manufacturing and services and also robust to the definition of corporate taxes.

Investment not only depends on corporate taxes but also on a bundle of other factors including investment climate factors. Among the different business regulations, entry regulations, investor protection regime and contract enforcement are likely to have the largest impact on investment. The main hypothesis is that favourable entry regulation stimulates investment. Business regulation data is drawn from the Doing Business Indicators (DBI) of the World Bank and refers to 2008 to 2014. The World Bank has introduced several measures of business regulations and business climate. The indicators measure the time, costs and number of documents/procedures needed to start a business or enforce contracts. Investor protection measures the shareholder protection against the misuse of corporate assets and is obtained from a survey of corporate and security lawyers (World Bank). Based on regulations, company laws, and court rules, the World Bank has developed several indicators such as "Extent of Disclosure Index", "Extent of Director Liability Index", and "Ease of Shareholder Suits Index", all ranging from 1 to 10. The Investor Protection Index is obtained from a weighted average of these indices. In addition to strength of investor protection, we consider three

aspects of business regulations: (i) starting a business, (ii) contract enforcement and (ii) strength of legal rights for obtaining credit. The strength of the legal rights index (scaled from 0 to 12) measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The Doing Business Indicators are perfectly suitable to analyze the relationship between business regulation and investment activity since they are calculated for a standardized domestic firm of between five and 50 employees one month after start-up. In Austria for the period 2008 to 2014, the ranking of these indicators has not improved over time. Costs of enforcement of contracts have increased, the decline in costs of starting a business is lower than that of the average of EU/OECD countries, and the position in the strength of legal rights for obtaining credit has deteriorated by two points on the scale ranging between 0 and 12.

In the following, bivariate correlations are used to study the relationships (Table 18). The analysis is mainly based on aggregate data for the EU-28 countries.

Table 18: Spearman rank correlations between the equipment and machinery investment ratio and investment climate factors

dependent variable: change in the ratio of investment in machinery and equipment (excluding IPP investmet) to GDP between 2008 and 2014 in percentage points

	r	p	variables in initial level	r	p
Corporate tax rate change, 2008-2014	-0.10	0.64	Corporate tax rate change, 2008	0.17	0.43
EATR, 2008-2014	0.09	0.66	EATR, 2008	0.22	0.30
Tax rate in % of profits, 2008-2014	0.54	0.00	Tax rate in % of profits, 2008	0.11	0.61
Strength of investor protection, 2008-2014	-0.20	0.34	Strength of investor protection, 2008	-0.26	0.21
Extent of disclosure, 2008-2014	-0.19	0.36	Extent of disclosure, 2008	0.00	1.00
Extent of director liability, 2008-2014	-0.35	0.09	Extent of director liability, 2008	0.13	0.54
Ease of Shareholder Suits Index, 2008-2014	n.a	n.a	Ease of Shareholder Suits Index, 2008	-0.13	0.53
Strength of legal rights for obtaining credit, 2008-2014	-0.19	0.35	Strength of legal rights for obtaining credit, 2008	-0.08	0.71
Enforcement contract time, 2008-2014	0.20	0.35	Enforcement contract time, 2008	-0.39	0.06
Enforcement procedures, 2008-2014	0.40	0.05	Enforcement procedures, 2008	-0.44	0.03
Enforcement costs, 2008-2014	0.17	0.42	Enforcement costs, 2008	-0.03	0.88
Costs of starting a business, 2008-2014	0.20	0.35	Costs of starting a business, 2008	-0.27	0.20

Note: Table reports Spearman rank correlations between the ratio of equipment and machinery investment to GDP and doing business indicators. The correlations are based on following countries: AUS, AUT, BEL, BGR, CHE, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, HUN, IRL, ISL, ITA, JPN, KOR, LTU, LUX, LVA, NLD, NOR, POL, PRT, ROM, RUS, SVK, SVN and SWE. For some variables few observations are available. Source: Eurostat, World Bank doing a business.

Figure 25 reports the scatter plot and correlation coefficients between both the initial level and the change in the enforcement of contracts, and the change in the ratio of equipment investment to GDP. The sample consists of

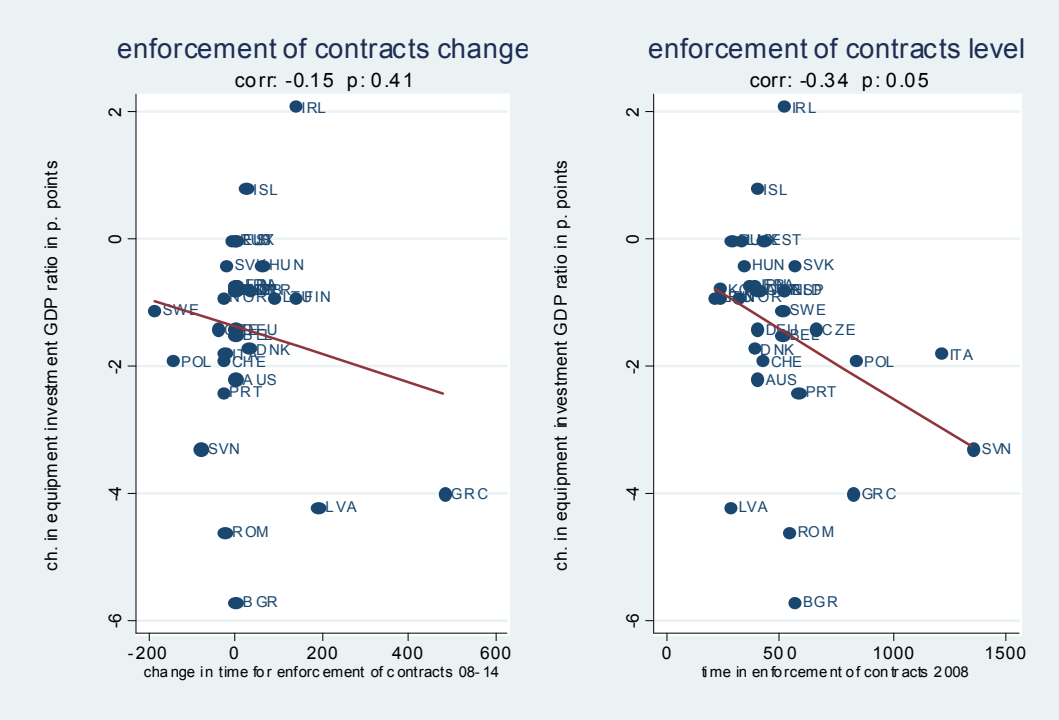
EU-28 countries plus selected other industrialized countries (Australia, Canada, China, Japan, Korea, Norway US,). The correlation coefficient between the change in equipment investment ratio and change in the time of enforcement of contracts is not significantly different from zero. When the level of time for enforcement of contracts is considered we find a significant negative correlation. However, the negative relationship is driven by a few outliers. Poland, Slovenia, Greece and Italy are all characterised by unfavourable conditions for enforcing contracts. At the same time they experienced a higher than average decline in the equipment investment to GDP ratio.

Turning to the results of the correlations for entry regulations in Figure 26, one can see that the costs of starting a business are not an obstacle for growth of equipment investment. This holds true for both the level of costs of starting a business and its change. Unreported results show that correlations for the other types of business regulations such as minimum capital requirements, number of procedures required to start a business and time in days to start a business are generally not significantly different from zero.

Figure 26 presents the correlations for the remaining business regulation indicator: legal rights for obtaining credit. Here we find a negative correlation between the change in the legal rights for obtaining credit and the equipment investment ratio. This indicates that countries which have strengthened their legal rights regime have a lower than average growth in the equipment investment ratio. This is contrary to expectations. Furthermore, change in the equipment investment ratio is not significantly related to the level of legal rights for getting credit.

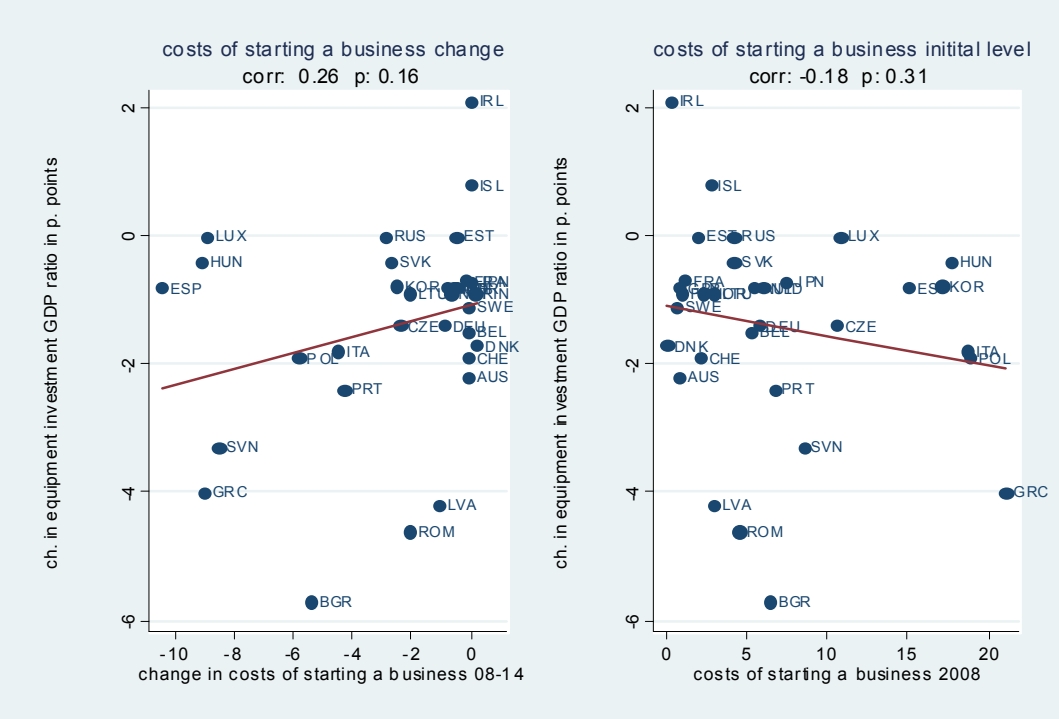
In summary, the results show that business climate factors are not a major factor for investment in machinery and equipment. Although EU member states in the last 10 years have reduced the time and costs associated with starting a business, this has not stimulated domestic investment.

Figure 25: Relationship between enforcement of contracts and equipment investment



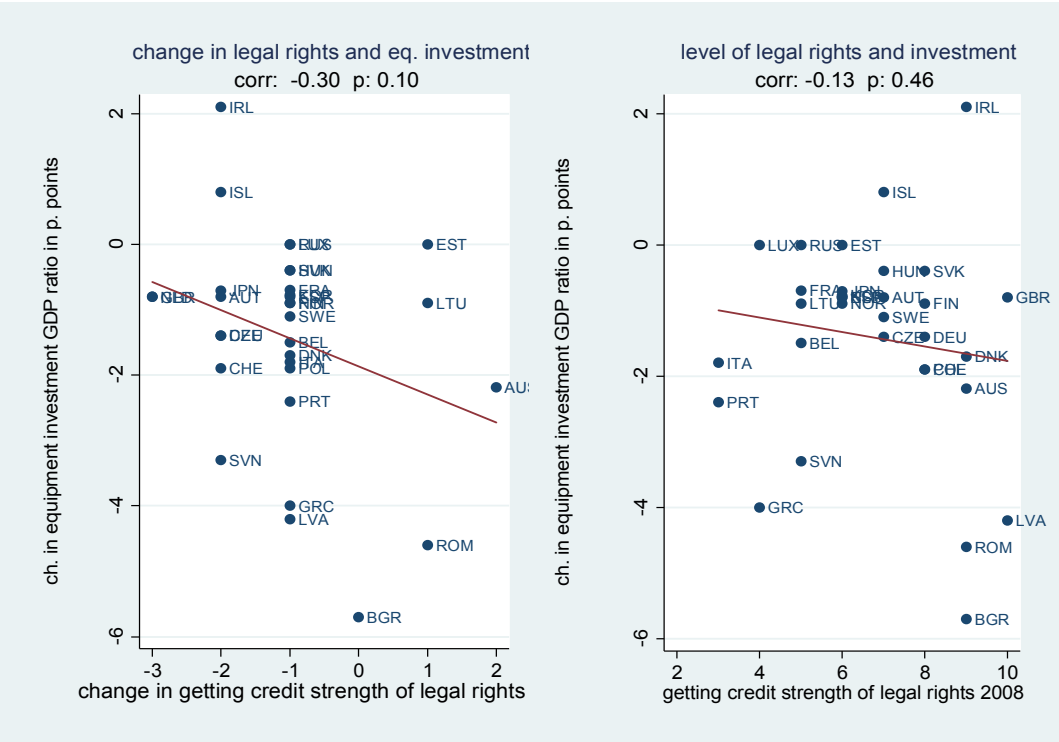
Source: OECD STATS, Eurostat , World Bank doing a business database

Figure 26: Relationship between costs of starting a business and equipment investment



Source: OECD STATS, Eurostat, World Bank doing a business database.

Figure 27: Relationship between legal rights for obtaining credit and equipment investment



Source: OECD STATS, Eurostat , World Bank doing a business database.

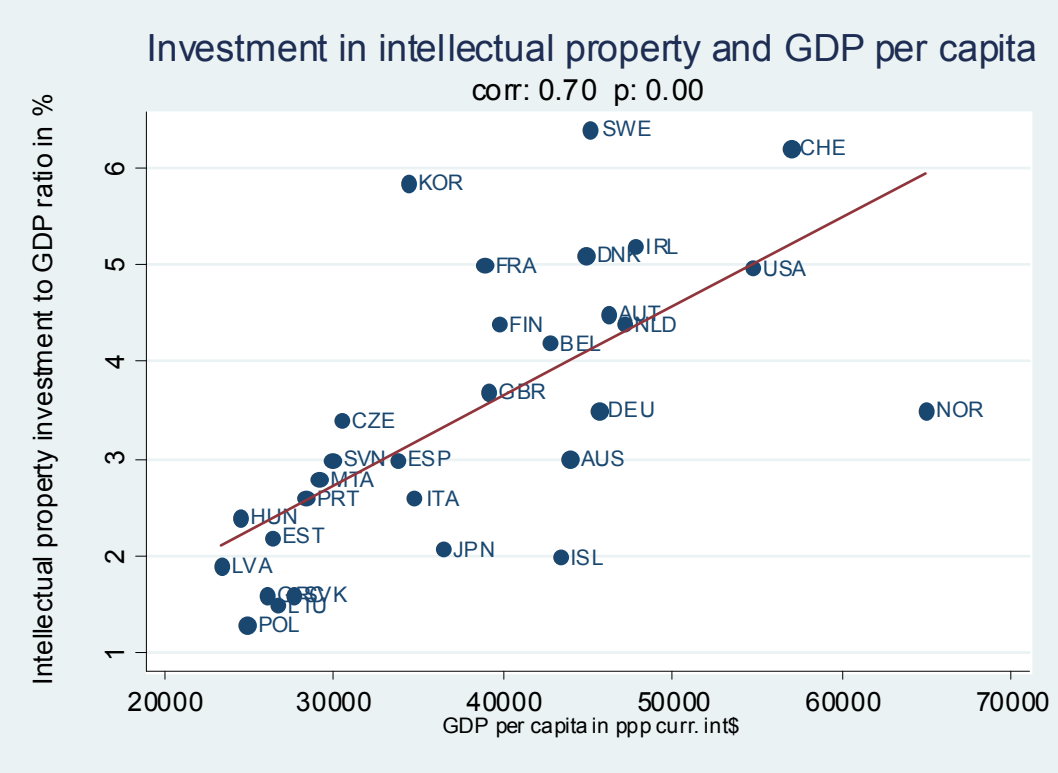
The next step is to investigate the relationship between investment in intellectual property products and business climate factors. Again the relationships can be illustrated using scatter plots. Evidence at the country level for the industrialized countries shows that the share of IPP investment is significantly positively related to strength of investor protection, level of R&D subsidies, extent of director liability and GDP per capita. In particular there is a strong correlation between GDP per capita and the share of IPP investment (r=0.7). Switzerland, the United States, Sweden and Demark are all characterised by high investment in IPP and GDP per capita. In Austria the share of IPP investment is in line with the level of GDP per capita. Furthermore, there are significant negative correlations between the share of IPP investment and business regulations along with a moderate correlation (-0.3) (Table 19). The main result is the strong correlation between the level of direct and indirect R&D subsidies and the share of IPP investment.

Table 19: Correlations between the investment ratio in intellectual property and business climate indicators

		Pearson correlation		Spearman rank correlation	
Corporate tax rate in %	r	0.20		0.25	
	p-value	0.26		0.17	
Costs of starting a business in %	r	-0.16		-0.23	
	p-value	0.36	**	0.21	
Total tax rate in %	r	0.02		0.05	
	p-value	0.90		0.77	
Obtaining credits of legal rights	r	0.04		0.02	
		0.78		0.67	
Procedures of enforcement contracts (#)	p-value	-0.30	*	-0.34	*
	r	0.09		0.06	
Time of enforcement contracts (days)	r	-0.31	*	-0.33	*
	p-value	0.08		0.06	
Costs of enforcement contracts (% claim)	r	0.05		0.06	
	p-value	0.78		0.74	

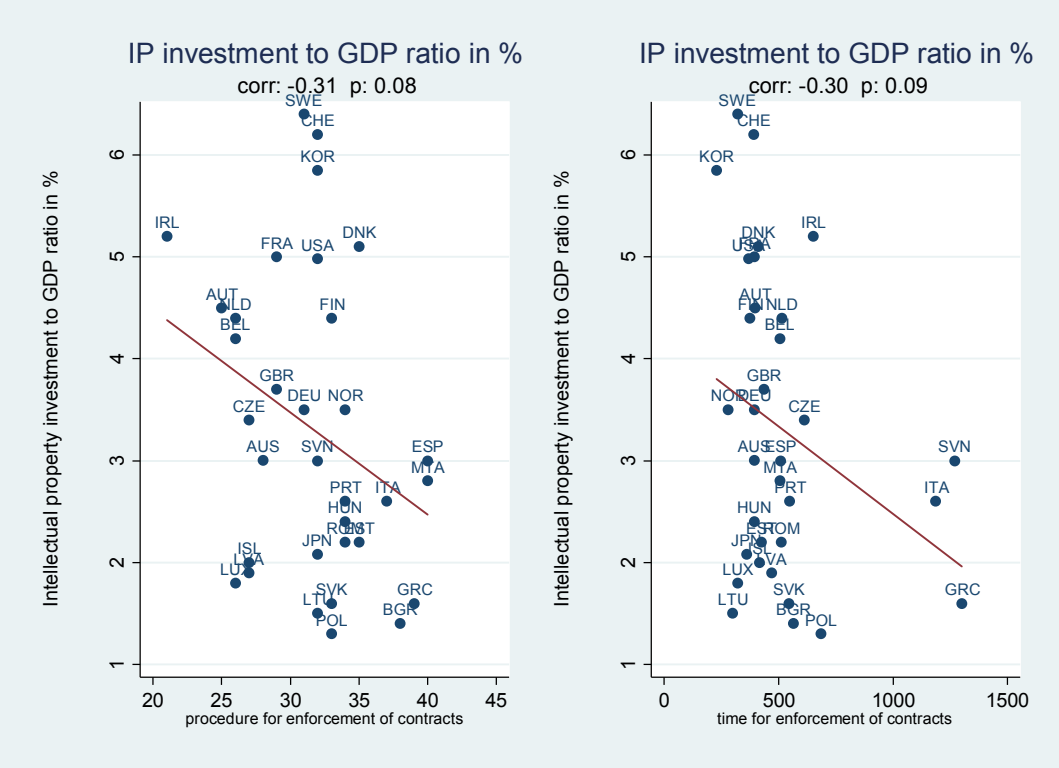
Note: Table reports Pearson and Spearman rank correlations between the ratio of IPP investment to GDP and doing business indicators. The correlations are based on following countries: AUS, AUT, BEL, BGR, CHE, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, HUN, IRL, ISL, ITA, JPN, KOR, LTU, LUX, LVA, NLD, NOR, POL, PRT, ROM, RUS, SVK, SVN and SWE. For some variables few observations are available. Source: Eurostat, World Bank doing a business.

Figure 28: Investment in intellectual property and GDP per capita



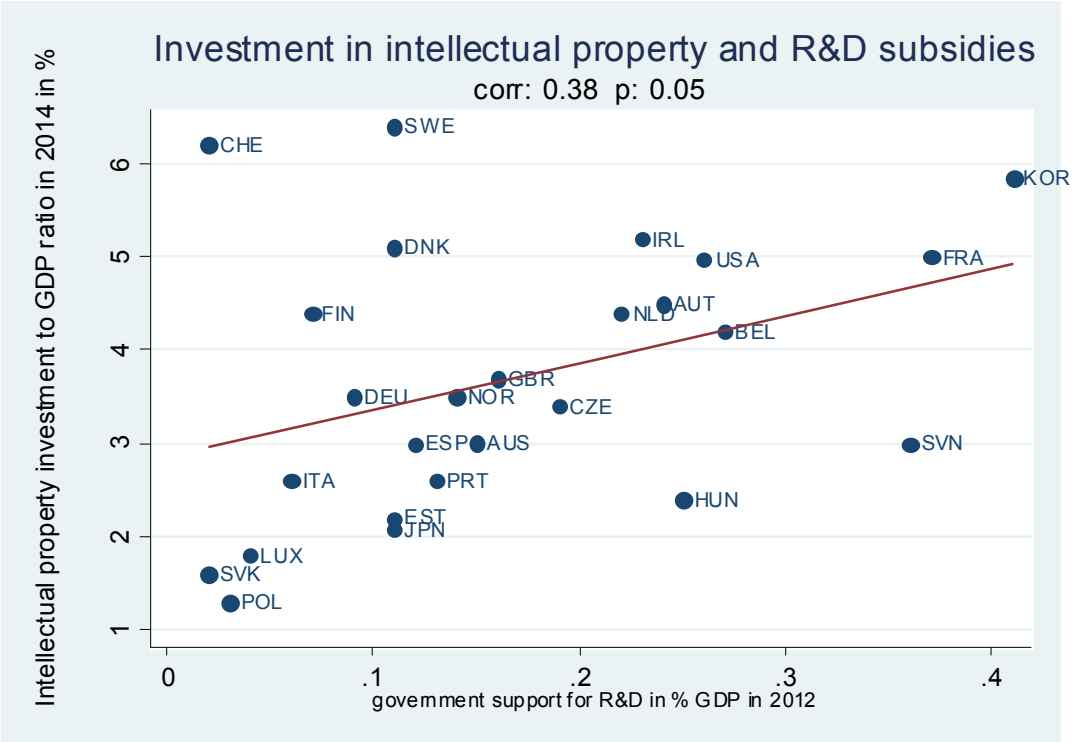
Source: OECD STATS, Eurostat ,

Figure 29: Investment in intellectual property products and business regulations



Source: OECD STATS, Eurostat .

Figure 30: Relationship between investment in intellectual property and direct and indirect R&D subsidies



Source: OECD STATS, Eurostat , World Bank doing a business database.

This means that private investment in knowledge intensive activities and government support for R&D goes hand in hand. In countries like South Korea, the United States, Ireland and France, a high level of IPP investment and a high level of R&D subsidies are exhibited at the same time. Exceptions are Switzerland and Sweden both of whom managed a high level of IPP investment despite a low level of R&D subsidies. The national accounts only comprise information on aggregate investment in intellectual property products. Giving that the share of investment in intellectual property in Austria is smaller than those in comparable EU countries, it is interesting to know which types of intangible assets are responsible for the gap. In order to investigate the source of the difference we provide firm level evidence based on the survey titled "Investing in Intangibles: Economic Assets and Innovation Drivers for Growth" conducted by the European Commission. The survey contains information on investment in different kinds of intangible assets. In particular, six different types can be distinguished: (i) training, (ii) software, (iii) company reputation and branding, (iv) R&D activities, (i) design of products and services, and (vi) organization or business process improvements. Information on investment is available for in-house investments and for investment purchased from external providers. There is also information on the barriers perceived by firms when making such investments.

Table 20 shows the percentage of turnover invested in different types of intangible assets in 2011. Most companies spend between one and five per cent in the different types of IP. Compared to the EU-6 countries, Austrian firms are more active in investment in training, software, design and organization, and business process improvements but less in R&D and company reputation and branding.

Firms that invested in any of the listed types of intangible assets are asked about the main reasons for making these investments (Table 21). In Austria, about half of the firms are either motivated by better economic returns, larger market shares, or better relationships with customers or business partners.

About 40 per cent mention greater efficiency of internal business processes as the motivation to invest in intangible assets. Furthermore, 30 per cent of the firms state that the main driver to invest in intangible assets is an improvement of internal skills. One fourth mentions more rapid development of new products or services as the main motivation to invest in intangible assets.

Table 20: Percentage of turnover invested in different types of intangible assets in 2011 (internal)

	AT	EU-6
	training	
0 %	33	41
Less than 1%	17	14
1 - 5 %	32	31
More than 5 to 15%	14	9
More than 15	4	5
	software	
0 %	51	60
Less than 1%	12	10
1 - 5 %	24	18
More than 5 to 15%	6	6
More than 15	6	5
	Company reputation and branding	
0 %	44	37
Less than 1%	12	11
1 - 5 %	29	33
More than 5 to 15%	9	11
More than 15	6	8
	R&D	
0 %	71	64
Less than 1%	7	8
1 - 5 %	10	15
More than 5 to 15%	10	8
More than 15	2	5
	Design of products and services	
0 %	41	50
Less than 1%	10	8
1 - 5 %	25	19
More than 5 to 15%	12	11
More than 15	13	12
	Organization or business process improvements	
0 %	27	41
Less than 1%	8	11
1 - 5 %	37	28
More than 5 to 15%	16	10
More than 15	13	10

Notes: EU-6 countries include BE - Belgium NL - the Netherlands DK - Denmark IE - Ireland FI - Finland SE – Sweden.

Source: European Commission, Brussels (2014): Flash Eurobarometer 369 (Investing in Intangibles: Economic Assets and Innovation Drivers for Growth).

Table 21: Drivers of investment in intangible assets

	AT	EU-6
Improvement of internal skills on the intangible assets	30	34
More rapid development of new company services or products	24	33

Better economic returns or larger market shares	50	48
Better relationships with customers and business partners	52	57
Greater efficiency of internal business process	40	40
Public financial support (grants, loans and support for recruiting new staff etc.) for intangible assets	9	10
Regulatory framework of your industry (environmental regulations, technical standards)	17	23

Source: European Commission, Brussels (2014): Flash Eurobarometer 369 (Investing in Intangibles: Economic Assets and Innovation Drivers for Growth).

Table 22: Barriers for investing in intangible assets

	AT	EU-6
Accounting rules for reporting capital expenditure are difficult to understand	6	17
High costs of the investment	26	43
Limited external sources of information or expertise	7	17
Unfavourable tax treatment of intangible assets	8	19
Limited public financial support (grants, loans, support for recruiting new staff etc.) for intangible assets	16	17
Regulatory framework of your industry is difficult to understand (environmental regulations, technical standards)	8	22

Source: European Commission, Brussels (2014): Flash Eurobarometer 369 (Investing in Intangibles: Economic Assets and Innovation Drivers for Growth).

Other motivators such as a regulatory framework and public financial support are not relevant with nine and 17 per cent, respectively. For the EU-6 countries comparison group, the ranking of the motivations are quite similar to that of Austria. Again "better economic returns or larger market shares" and "better relationships with customers and business partners" are the main motivations followed by greater efficiency of the internal business process. Public financial support (grants, loans and support for recruiting new staff, etc.) for intangible assets is least important.

High costs are the main barriers to investing in intangible assets (26%), followed by limited public financial support (16%). Other barriers are not relevant including unfavourable tax treatment of intangible assets (8%), regulatory framework and limited external sources of information or expertise (Table 22).

An important question is whether countries that have introduced a patent to the IP box tax regime have increased their level of innovation input or innovation output. In the public there is debate on whether the introduction of the patent box has increased the level of innovation input or output or investment in intellectual property products in general. Literature on the impact of the introduction of the IP/ patent box regime is mixed. Bradley,

Dauchy, and Robinson (2015) find that a one percentage point reduction in the tax rate on patent income leads to an increase in the number of patent applications by three per cent. The data consists of 19 million patent applications for 70 inventor countries. The data ends in 2012, thus the most recent patent box introductions in the United Kingdom (2013), Portugal (2014), and Italy (2015) could not be included. Klodt and Lang (2016) find that patent boxes are mainly used for tax evasion and do not stimulate innovative activities. Here innovation activities are measured as patent applications and R&D activities.

Other studies address the question of whether or not high corporate taxes have an impact on investment in intangible assets. Grubert (2003) finds that more than half the income of US companies originated from intangible assets located in low-tax countries. Huizinga and Laeven (2008) show that European firms have shifted their intangible assets to subsidiaries in low-tax countries. Dischinger and Riedel (2011) and Karkinsky and Riedel (2012) find a negative impact of corporation tax on the number of Patent applications. Griffith et al. (2014) study the impact of the patent Box on patent applications in Europe. The authors find that countries that have introduced a patent box (here Benelux countries) have a higher number of patents than other EU countries. In particular, the authors find that the share of patents held in Luxembourg is most sensitive to changes in taxes, with a semi-elasticity of 3.9 per cent.

De Rassenfosse (2015) suggests that patent boxes are not an appropriate innovation policy tool because they target the back end of the innovation process, where market failures are less likely to occur. Consequently, patent boxes regime should be designed to provide additional incentives to commercialize the innovation output emerging from domestic R&D activities.

Preliminary findings on the effectiveness of the patent box tax regime are mixed. Of the five EU countries (BE, ES, NL, MT, LU) that introduced the patent box tax regime between 2007 and 2010, only Malta, Spain and Belgium

experienced faster growth in the share of investment in IPP as compared to average of the 28 EU-countries (Table 23).

Table 23: Ratio of investment in intellectual property products before and after the introduction of the patent box

	Ratio of investment in intellectual property products to GDP in per cent		difference
Country (year of introduction of the patent box regime)	average 2005-2006	average 2007-2014	
Belgium (2007)	3.1	3.8	0.6
Netherlands (2007)	4.0	4.2	0.3
All countries	2.7	3.1	0.4
	average 2005-2007	average 2008-2014	
Spain (2008)	2.2	2.7	0.5
Luxembourg (2008)	2.1	2.2	0.0
all countries	2.8	3.2	0.4
	average 2005-2009	average 2010-2014	
Malta (2010)	2.0	2.9	1.0
all countries	2.9	3.2	0.3

Source: National accounts. Eurostat.

Malta experienced growth of one percentage point in the IPP investment share, followed by Belgium with +0.6 percentage points and Spain with 0.5 percentage points. The introduction of the patent box in the Netherlands and Luxembourg has not lead to an increase in the IPP investment share. The findings are consistent with those obtained on firm level data on IPP usage. Another argument for implementation of patent boxes is the increased attractiveness for foreign direct investment in intangible assets. Intellectual property and the income derived from IP can be easily shifted to low tax destination. Empirical evidence shows that countries that introduced a patent box regime between 2007 or 2008 (Belgium, China, Luxembourg, Netherlands, Spain) could not achieve a higher inflow in R&D, design and testing activities. The only exception is the Netherlands who increased the number of FDI projects in R&D and related activities by more than 200 per cent to that of the pre reform period. Similarly, the attractiveness for FDI in headquarter functions has not increased after the introduction of the patent box regime.

Table 24: Number of inflow of FDI projects in R&D and related products before and after the introduction of the patent box

	Number of FDI projects in R&D, design and testing		
Country (year of introduction of the patent box)	2003-2006	2007-2011	change
Belgium	29	39	34.5

Netherlands	10	37	270.0
Rest of world	2685	3662	36.4
	2003-2007	2008-2011	change
Luxembourg	1	3	200.0
China	566	436	-23.0
Spain	83	76	-8.4
Rest of world	2769	2621	-5.3

Source: FDI markets data.

6 Determinants of foreign direct investment

6.1. Determinants of foreign direct investment in general

This section investigates the determinants of investments in the EU-27 countries. We particularly consider factor-cost differences (e.g. corporate taxes and labour costs), factor endowments (e.g. skills, R&D, and broadband penetration) and policy factors (e.g. FDI regulation, costs of starting a business, and labour market flexibility indicators). The main contribution of the present work is its detailed empirical analysis of the determinants of greenfield investment in the EU member states using panel data methods. The empirical analysis will be more detailed than previous studies thanks to its use of a large number of potential FDI determinants. The literature on the determinants of FDI using gravity equations is extensive (see Chakrabarti 2001 and Zwinkels and Beugelsdijk 2010 for recent reviews of the literature). Wolff (2007) and Bénassy–Quéré, Gobalraja, and Trannoy (2007) present recent studies investigating FDI determinants for EU countries. However, few studies have investigated the determinants of greenfield investments. In summarising the literature, Slangen and Hennart (2007) find that the factors determining the choice of FDI entry mode differ widely with respect to parent, subsidiary, industry, and host-country characteristics, whereas the latter include the host economy's size and growth rate, per capita income, government restrictions, and the cultural distance between the source and host country.

Foreign direct investment can take the form of greenfield investment or cross-border mergers and acquisitions. Greenfield investment involves setting up a completely new business or expanding an existing foreign affiliate, whereas cross-border mergers and acquisitions (M&A) indicate a change in ownership

of an existing firm. UNCTAD (2000) suggests that greenfield investment is more favourable than cross-border M&As because it increases the host country's capital stock and thereby production capacity. Cross-border M&As, on the other hand, leave capital stock and production capacity unchanged (at least in the short term). In fact, recent empirical studies find that greenfield entry has a relatively greater positive effect on company or macroeconomic performance in comparison to other entry models (Williams, 2003; Wang and Wong, 2009). The related theoretical literature does not agree on whether greenfield subsidiaries perform better or worse than acquired ones (Slangen and Hennart, 2007).

Across the EU countries, there is considerable variation in the ratio of greenfield investment to GDP over time. The unweighted ratio of greenfield investment to GDP is about three per cent on average across countries over the period 2003 to 2010. Bulgaria, Slovakia, and Romania all exhibit higher-than-average greenfield investment ratios of around eight per cent or more, while France and Italy have the lowest ratios of inward greenfield investment.

The empirical specification takes into consideration a wide range of potentially relevant determinants of greenfield investment. As outlined above, these variables include market size, market growth, labour costs and other cost-based factors, corporate and labour taxes, skills, technological infrastructure, and FDI regulations. Table A32 in the Appendix shows the marginal effects obtained from the PPML estimator of the determinants of bilateral Greenfield investments in the EU-27 countries.

It should be noted that a large number of factors are excluded from the final specification because they are not significant at conventional levels. In particular, labour market flexibility, indicators of intellectual property rights protection, and indicators of investor protection are not significant when source- and target-country effects and common-time effects are taken into account. The cost of doing business and the FDI regulatory index have the

expected negative sign, but are statistically insignificant even when based on one-sided tests (involving a p-value of 0.10).

The key results are the high sensitivity of FDI with respect to corporate taxes. The semi-elasticity of greenfield investments with respect to effective average corporate tax rates is about -12.5. This means that a one-percentage-point increase in the effective average tax rate in a given host country reduces the value of greenfield investments by 12.5 per cent in said country. Overall, this is a very large effect and a new empirical result in the literature when compared to the meta-analysis performed by Feld and Heckemeyer (2011). Based on the meta-analysis by De Mooij and Ederveen (2008), an EATR semi-elasticity of around -6 using data on FDI flows or stocks is determined. This clearly shows that greenfield FDI is much more sensitive than total FDI to changes in corporate taxes.

Hourly wages in the host country have a significantly negative effect, indicating that a rise in labour costs leads to less greenfield investment. The coefficient indicates that an increase in hourly wage labour costs by one percentage point leads to a four per cent decrease in greenfield FDI flows. Note that hourly wage compensation is used as the measure of labour costs, as unit labour costs do not have a significant impact on greenfield investment.

Furthermore, EU membership in 2007 led to significantly higher greenfield investment within the EU member states (see specification iii). Similarly, the introduction of the euro from 2007 onwards aided the four EU countries in question in achieving a sizable rise in greenfield investments from the previous euro zone nations. Previous empirical studies also find large positive effects for the introduction of the euro on FDI inflows (De Sousa and Lochard, 2011; Petroulas, 2007).

The coefficient of the share of tertiary education in the host country is both positive and partly significant. However, in two out of three specifications, the tertiary education share is only significant at the 10 per cent level.

Gravity factors, and host and source country GDP exhibit the expected sign. The coefficient of the logarithm of source country GDP is positive and significant, indicating that the value of a given source country's greenfield investments in one of the EU-27 countries increases with the source country's size. However, market size is a less important determinant of greenfield FDI than of total FDI flows.

The relative difference in GDP per capita is positive, indicating that the greater the difference in GDP per capita between the host and source country, the greater the value of greenfield investments between the two countries. This implies that greenfield investment between the OECD countries and the EU countries is mainly characterised by vertical rather than horizontal FDI activity. Furthermore, the coefficient of the logarithm of the share of tertiary education and the logarithm of the R&D to GDP ratio are both positive and highly significant, indicating that outward greenfield investment is higher in skill-abundant and technologically advanced source countries. This is consistent with Carr et al. (2001).

The coefficient of geographical distance is not significant, indicating that greenfield investment is independent from the distance between the investing and host country. One explanation for the insignificant role of distance is that advances in ICT have made more distant host countries increasingly attractive to foreign investors (Tang and Trevino, 2010). Meanwhile, bilateral greenfield investments are higher if two countries share a border, but a common language and former colony links are not associated with any such increase.

When distinguishing between EU-15 and EU-12 host countries, the semi-elasticity of Greenfield FDI with respect to the effective average tax rate is -15

for the EU-15 and -8 for the EU-12 countries (see Table A33 in Appendix). Again, the semi-elasticities of the impact of corporate taxes on greenfield investments are higher than those found for total FDI in previous studies, but are not strictly comparable because of the different definition of FDI. Furthermore, wage costs have the expected negative sign. For the EU-12 countries, there is no significant relationship.

To sum up, the findings show that factor cost advantages, the introduction of the euro and EU membership significantly influence the decision to make greenfield investments in the EU countries. Skills also play a positive role in attracting FDI in the EU-15 countries. In particular, the introduction of the euro in four EU countries from 2007 onwards increased inward greenfield investments from the previous euro zone countries. Effective average tax rates have a very significant impact, as indicated by a semi-elasticity of about -12.5. Furthermore, greenfield investment is highly sensitive to changes in source country GDP, but not significantly related to host country GDP.

Most determinants (e.g. employment protection, the cost of starting a business, ICT infrastructure, intellectual property rights, and labour market protection) fail to have a significant impact on greenfield investment when controlling for host, source, and common-time effects. Some of these FDI determinants are significant at the cross-sectional level when based on partial correlation coefficients.

Findings indicating that EU membership, the introduction of the euro, and factor costs are the most important factors in determining greenfield investment have several important policy implications. Given the large effects of economic and monetary integration on FDI, further integration should be the key policy at national and EU levels. The EU-12 countries, meanwhile, can lower their corporate tax rates in order to attract further greenfield investment, but these rates have already converged at a level significantly lower than those in other world regions. The EU-12 countries are thus unable to

differentiate themselves competitively from their neighbours. In addition, corporate taxes are required to finance infrastructure and education, which may in turn help to attract greenfield FDI directly or indirectly via higher productivity growth. In the EU-15 countries, lowering company taxation will lead to additional greenfield investments. In most of the EU-15 countries, however, greenfield investments represent only a tiny proportion (around one per cent) of GDP. As such, the loss of corporate tax revenue is unlikely to be offset by additional revenues derived from greenfield FDI.

6.2. Determinants of foreign direct investment in intangible property products

This section investigates the determinants of international investment in intangible assets. We particularly focus on greenfield investment rather than cross-border M&As because the effects of the latter on the performance of the acquired firm is ambiguous. Intangible property products are defined as software, except i) video games, (ii) advertising, public relations and related activities, (iii) headquarters, (iv) research & development and (v) design and development & testing. The empirical model is based on a FDI gravity model augmented by a large number of policy factors (e.g. labour costs, strength of investor protection) as well as factor endowments (e.g. quantity of skills). Our measure is the number of greenfield FDI projects in intangible property products or services. Unlike for the contribution of intangible assets to growth and productivity at the macroeconomic level, little is known about the drivers of international investment in intangible assets. Despite growing interest in the drivers of international investment in intangible assets, few studies have investigated the international location factors for these types of products. An exception is the study by Castellani, Jimenz and Zanfei (2013) which investigates the determinants of greenfield FDI in R&D, and development, design and testing activities. Such activities represent a subgroup of intangible investments. Amoroso et al. (2015) use a broader definition and include (i) research and development (R&D) activities, (ii) design,

development and testing, (iii) education and training, (iv) headquarters activities and (vi) information and communication technologies.

The work will contribute to the growing literature on the drivers of intangible assets by investigating the determinants of international investment in intangibles. Note that while cross-border M&As and innovation cooperations are also important aspects of the internationalisation process (Hollenstein and Berger, 2015; Davies and Desbordes, 2015), the determinants of these activities are not considered here due to a lack of available data. Knowledge of the determinants of greenfield FDI in intangible assets is particularly important to policy makers because greenfield investment often leads to higher economic growth in the host country, whereas the effects of FDI through mergers and acquisitions are less straightforward (see Wang and Wong, 2009). The study draws on a large database, namely the FDI markets database, containing more than 110,000 FDI projects, including some 18,000 cross-border FDI projects in intangible assets.

The availability of FDI project data by function makes it possible to analyse greenfield FDI activities in intangible assets defined as FDI projects in (i) software (except video games), (ii) advertising, public relations and related activities, (iii) headquarters, (iv) research & development and (v) design, development & testing. There is also information on mineral explorations and entertainment. However, the number of FDI projects in these areas is very small. Table 25 shows the structure of intangible assets by subgroups. Software accounts for the major bulk with more than one third of all projects followed by headquarter services and design, and development & testing.

Table 25: Structure of greenfield FDI projects in intangible assets by subgroup

	EU-27	40 host countries
Software except video games	40	36
Advertising, public relations and related activities	9	7
Headquarter services	24	22
Research & development	10	12
Design, development & testing	17	22

Source: FDI markets database, own calculations.

Firms with a high level of investment in knowledge-based assets are more likely to invest in intangible assets abroad. Hence, countries that are relatively abundant with highly educated workers and with a high level of R&D expenditures relative to GDP show higher levels of FDI outflows. Location-specific advantages refer to the conditions in the host country. These factors can be classified into four groups: (i) demand side factors, (ii) knowledge-based factors, (iii) factor costs and (iv) product market regulations and institutional characteristics.

Previous studies on the determinants of cross-border activities in knowledge-based activities primarily deal with foreign investment in R&D and/or software. Studies on international R&D activities by multinational firms have identified two main motivations for cross-border investments in R&D: (i) "asset-exploiting" strategy and (ii) "asset-augmenting" attitude (von Zedtwitz and Gassmann, 2002). Dunning and Lundan (2008) distinguish between three main motivations for international investment in R&D (see also Hollenstein, 2013): (i) market seeking strategies (e.g. market size, market growth, proximity to suppliers) ("asset exploiting strategies"), (ii) knowledge and resource seeking strategies (e.g. presence of good universities, availability of skilled workers) ("asset augmenting strategy") and (iii) efficiency seeking strategy (low wage costs, tax advantages).

The so-called asset-exploiting strategy means that multinational firms undertake foreign R&D in order to adapt their products to local market conditions. Thus, size of the market, market growth and proximity to potential suppliers are the main factor for this type of motivation. The larger the size of the market and the better its market growth prospects, the more likely foreign affiliates are willing to undertake R&D activities and other knowledge based activities. Empirical evidence confirms that market demand is an important determinant of FDI in R&D in general (Ito and Wakasugi, 2007) and for development activities in particular (Shimizutani and Todo, 2008). However, it is unclear whether this also holds for international investments in intangible

assets. Unreported results based on FDI market data suggest that small countries, such as Singapore, Ireland and Switzerland, given their respective size, are disproportionally successful in attracting international investment in intangible assets.

The second major motivation for cross-border investments in R&D and related knowledge based activities is obtainment of access to local scientific and technological resources and skilled labour. This is referred to as the "asset- or knowledge-seeking/augmenting" attitude (Dunning and Lundan, 2008). Previous empirical literature agrees that the available knowledge base – such as scientific infrastructure and educational qualifications of the workforce – are the main factors in attracting FDI in R&D and related activities (Rilla and Squicciarini, 2011; Narula and Bellak, 2009 for surveys of the literature). For instance, Kumar (2001) finds that a higher ratio of scientists and engineers has a positive effect on the R&D expenditure of MNCs' affiliates. More recently, based on 1,722 R&D projects offshored between 2002 and 2005, Demirbag and Glaister (2010) find that the knowledge infrastructure (R&D, level of education) in the host country is a major determinant of cross-border investments in R&D. Belderbos et al. (2009) find that the scientific strength of local universities is an important factor for the international location choice of R&D. Similarly, Liu et al. (2011) and Doh et al. (2009) find that skills in the host country are the main factors in attracting FDI in knowledge-intensive services.

In summarizing the literature on the determinants of FDI in knowledge intensive industries, Hollenstein (2013) suggests that asset-exploiting is more important than asset-seeking as a motive of FDI in these activities, although the relevance of asset-seeking motivation has strongly increased over the last years.

Firms' rankings of the importance of location factors for knowledge intensive activities, such as R&D, are consistent with the view that the knowledge-base in the host country is an important determinant of cross-border investment in these activities. Based on a survey of EU multinational firms conducting R&D

activities, Moncada-Paterno-Castello, Vivarelli and Voigt (2011) find that access to specialized knowledge, availability of researchers, and the legal framework are the most important factors for international R&D outsourcing. Access to the market, cheap labor cost of researchers and proximity to suppliers appear to play a secondary role as drivers of R&D locations abroad. Therefore, one can conclude that the importance of "asset exploiting" motives seems to be decreasing over time. Based on a survey of 246 multinationals in the US and EU, Thursby and Thursby (2006) find that access to scientists and engineers (both as employees and at universities), intellectual property rights protection, and ownership are the main factors in locating corporate R&D in developed countries, whereas R&D tax breaks and subsidies are ranked as least important. However, in emerging countries, demand is more important than supply factors according to these authors. In contrast, using recent EU survey data on business trends in R&D investment, Cincera et al. (2010) find that access to public support for R&D is the most important factor influencing a location's attractiveness for R&D. However, this stands in contrast to the previous literature.

The choice of investing abroad in knowledge-based activities is also likely to be influenced by institutional factors. These factors include the strength of protection for IPR in the host country and FDI regulatory regime. Branstetter et al. (2006) find empirical evidence that a strong IPR regime in the host country has a positive impact on local R&D expenditure of US foreign affiliates. However, the relationship between IPR protection and FDI in knowledge-based activities is not clear-cut. On the one hand, strong IPR protection may lead to other forms of internationalisation, such as licensing. On the other hand, a weak IPR regime increases the probability that innovations and products will be imitated, which makes a host country less attractive for cross-border investments in knowledge-intensive activities (Javorcik, 2004).

To sum up, the literature confirms that countries that are relatively abundant in skilled labour, with a high level of R&D expenditures and with excellent

universities, tend to be an attractive location for cross-border investments in R&D. This relationship may hold true not only for cross border investments in R&D, but also for international investments in other types of intangible assets, such as software that shares many common characteristics with research and development activities. However, intangible assets not only include R&D and software, but also activities, such as advertising and market research, which rely less heavily on the availability of knowledge-based assets in the host country but more on demand-side factors.

Factor costs are commonly regarded as less important in influencing FDI activities in knowledge based factors. However, Kumar (2001) finds that wages of R&D personnel have a negative effect on the R&D expenditure for affiliates of MNCs. Similarly, a number of other studies find that corporate taxes and labour costs are significant determinants of FDI in knowledge-intensive services (Doh et al., 2009; Bunyaratavej et al., 2008; Farrell, 2005).

Furthermore, knowledge intensive activities are typically highly agglomerated. The reason for this geographical concentration lies in the potential for knowledge spillovers from competitors and universities. Therefore, greenfield investment in intangible assets may exhibit a high degree of path dependence. It is often stated that there are tendencies to follow the location decisions of other multinational firms. These strategies are commonly referred to as "herd behaviour" or "follow the leader" strategies (Rilla and Squicciarini, 2011).

Another factor for international investment in knowledge-based activities is geographical distance. FDI flows in intangible assets are expected to decrease with distance between host and home country. Empirical evidence is mixed. Based on the FDi Markets database, Castellani et al. (2011) suggest that distance is less important in determining bilateral FDI activity in R&D than cultural factors and regional trade agreements, which are significant and positive.

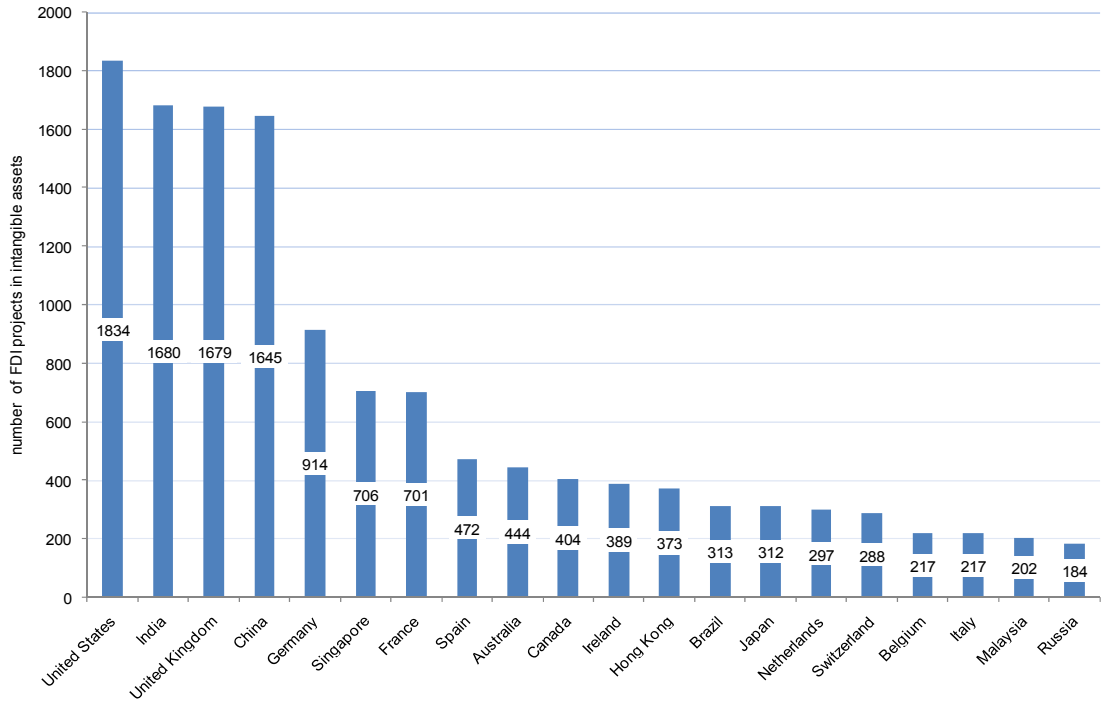
The empirical specification of the FDI gravity equation takes into consideration a wide range of potentially relevant determinants of FDI. In addition, a wide range of characteristics of the host and home markets play an important role in greenfield investment in intangible assets. As outlined above, these variables include market size, skills, R&D endowment, ICT infrastructure, cost-based factors (such as labour costs and corporate taxes), and FDI restrictions.

The origins of the gravity model come from the gravity theory in physics. Newton's law of universal gravitation states that the gravitational attraction between two objects is proportional to the product of their masses and inversely proportional to the square of the (geographical) distance between them. In other words, the larger the economies, the larger the FDI activities, and the greater the geographical distance, the lower the FDI activities.

The data covers greenfield FDI projects and investment flows in intangible assets for 26 major parent countries (Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Hong Kong, India, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Russia, South Korea, Spain, Sweden, Switzerland, the United Kingdom, and the United States); 40 host countries, namely the EU-27 member states (excluding Malta and Cyprus); and 15 OECD and emerging countries (including Australia, Brazil, Canada, China, Hong Kong, India, Israel, Japan, New Zealand, Norway, Russia, Singapore, South Korea, Switzerland, and the United States). The data refers to the period 2003 to 2011 for the descriptive statistics, and the period 2003 to 2010 for the regression model. The FDI projects are aggregated across source destination pairs.

Graph 1 shows the distribution of the number of greenfield investment projects in intangible assets by country for the top 20 destinations based on the estimation sample with about 15,000 greenfield investment projects in intangible assets.

Figure 31: Number of greenfield FDI projects in intangible assets by host country (cumulated 2003-2011)



Notes: descriptive statistics are based on 40 host countries and 26 parent countries representing 90 per cent of total FDI projects in intangible assets. Source: FDImarkets data.

One can see that the United States, India, the United Kingdom and China are the top locations for international investment in intangible assets, receiving almost one half of investment projects worldwide. It is interesting to note that smaller countries, such as Singapore, Hong Kong, Ireland and Switzerland receive a high share of investments in intangible assets given their country size. Among the EU countries, Germany is second after the United Kingdom and then followed by France, Spain and Ireland.

Table A34 in the Appendix shows the results of the fixed-effects negative binomial estimator of the determinants of bilateral greenfield FDI projects in intangible assets where the fixed effects consist of parent-host country pairs.[1] The table includes coefficients and marginal effects assuming that the fixed effects are zero. Unreported results show that the results are robust when using

[1] We use the xtnbreg command in STATA with the fe option to fit our data to the conditional fixed effects negative binomial model.

the quasi-maximum likelihood (QML) Poisson regression model with fixed effects.[2] However, the standard errors of the FDI determinants are somewhat larger in most cases. Note that a number of policy related host country factors are excluded from the final specification because they are not significant at conventional significance levels. In particular, FDI regulatory restrictiveness, the share of scientists and engineers, number of highly cited researchers as a proxy of the scientific strength of the academic sector, and the corporate tax rate are either not significant or show the wrong sign when bilateral source and host country fixed effects and common time effects are taken into account.

For the total sample of 40 host countries, the results show that greenfield investments in intangible assets depend significantly on the GDP of the host and parent country, skills of the parent and host country, and strength of investor protection. This thus indicates that the number of greenfield investment projects in intangible assets are higher in large and skill-rich countries. It also shows that FDI in intangible assets flows from large and skill rich countries to other large and rich intensive countries. Overall, the findings are consistent with the previous empirical literature, which finds that the available knowledge base – indicated by the educational qualifications of the workforce and the quality of the educational system – is a main factor in attracting FDI in knowledge intensive activities, while cost-based factors only play a minor role (Rilla and Squicciarini, 2011).

Estimates can be used to compare the predicted and actual numbers of FDI projects in intangible assets with the predicted number indicating FDI potential (Table 26).

[2] The STATA procedure xtpoisson with the robust option is used to estimate the equation.

Table 26: Comparison of predicted and actual FDI projects in intangible assets, 2005-2011

	actual FDI projects	predicted FDI projects	ratio
United Kingdom	1026	236	4.3
India	1013	159	6.4
United States	929	313	3.0
China	872	170	5.1
Germany	556	171	3.3
France	410	166	2.5
Singapore	370	161	2.3
Ireland	293	117	2.5
Spain	290	150	1.9
Australia	270	137	2.0
Canada	259	180	1.4
Brazil	253	95	2.7
Japan	218	213	1.0
Hong Kong	175	140	1.2
Netherlands	152	123	1.2
Switzerland	145	76	1.9
Poland	144	124	1.2
Italy	124	99	1.3
Romania	117	61	1.9
South Korea	116	173	0.7
Belgium	111	114	1.0
Russia	108	214	0.5
Israel	93	85	1.1
Austria	79	55	1.4
Sweden	76	97	0.8
Hungary	61	47	1.3
Czech Republic	61	46	1.3
Denmark	54	85	0.6
Finland	38	66	0.6
Bulgaria	30	37	0.8
Portugal	28	54	0.5
Norway	27	81	0.3
Slovakia	22	20	1.1
Luxembourg	21	29	0.7
Estonia	19	24	0.8
New Zealand	16	23	0.7
Lithuania	13	35	0.4
Greece	11	31	0.4
Slovenia	6	18	0.3
Latvia	4	19	0.2

Notes: Predicted number of FDI projects in intangible assets are calculated based on the coefficients displayed in Table Appendix.

One can see, for example, that China, Germany, India, the United Kingdom and the United States received a larger number of FDI projects than predicted by the model with actual FDI projects exceeding the predicted ones by factor 3 (=300 per cent or higher). This indicates that these countries are very successful in attracting FDI flows in knowledge intensive activities given size and skill endowment, and strength of investor protection. France, Singapore, Ireland, Australia and Brazil are also successful in achieving a

higher level of FDI projects than predicted by the model (200 per cent or higher). Conversely, the number of projects in South and Eastern European countries is much lower than predicted by the count data model. Surprisingly, the Scandinavian countries are also not successful in attracting FDI projects given their country size and skill endowment.

In summary, the empirical results using the fixed-effects negative binomial regression model show that Greenfield investment in intangible assets depends on the share of labour force with university degree, strength of investment protection, and size of the market. Size of the country and skills of the parent country are also significant. Labour costs and taxes are not relevant. Since the knowledge base is more important than cost factor considerations, one can conclude that international investments are driven by asset seeking rather than asset exploiting strategies.

The results of this study have important policy implications not only in direct relation to FDI; they also affect policies related to investment in education, product market regulation, and strength of investor protection. First, strengthening of investor protection should be a key goal of policy makers. This holds particularly true for the southern European countries that are characterised by a low strength of investor protection. Second, the presence of a skilled labour force is a precondition to achieve a large number of FDI projects in intangible assets. Therefore raising the quality and supply of tertiary education should be another objective of policy makers. Third, wage costs and corporate taxation do not play a role in attracting FDI inflows in intangible assets. Thus, cutting corporate taxes is not a policy option.

6.3. Patent box regime and FDI in R&D related activities

This section investigates the impact of the introduction of the patent box/IP regime on FDI inflows in R&D and related activities using city level data. The latter includes design, developing and testing activities besides R&D activities. The impact is estimated by the difference-in-differences estimator. This

estimator compares the difference in FDI inflows in these activities between the treatment group (cities affected by the patent/IP box regime) and the control group (cities not affected by the patent/IP box regime) before and after the introduction of a patent/IP box regime. In order to account for the selection bias, several control variables are added (presence of a local top university, size of the region, R&D tax incentives and belonging to a special economic zone in the case of China). The data is based on unique city level data with about 1300 observations for the baseline as well as the follow-up period. We employ city level data rather than company level or cross-country level data. The main reason is that innovation activities are, for the most part, geographically concentrated in cities.

Table 27 provides the results for the effects of the implementation of the patent/IP box regime on FDI inflows in R&D and related activities. The results show that the Dutch patent/IP box regime leads to a significant increase in the number of FDI inflows in R&D and related activities. On average, there is an increase across Dutch regions of about one FDI project in R&D and related activities. Expressed in number of jobs, this amounts to 100 additional jobs across regions, or € 6 million (expressed monetarily). The increase is remarkable in relative terms with an increase in FDI inflows in R&D and related activities of about 100 percent.

In the remaining countries, the implementation of the patent/IP box regime is not significantly associated with an increase in FDI activity in R&D and related activities. This is not surprising in China's case, since the introduction of the patent/IP box reform in 2008 led to the loss of the preferential tax treatment of foreign-owned companies. In Spain and Belgium, no increase in FDI inflows and R&D and related activities can be detected, indicating that the patent/IP box regime is not effective.

Table 27: Difference-in-differences estimates of the patent/IP box on FDI inflows in R&D (number of FDI projects in R&D and related projects)

Baseline	Control	F&E in R&D Treated	Diff (T-C)	t-stat	p-value	# treated
				China		
Baseline	1.33	5.31	3.98	10.79	0.00	59
Follow-up	1.30	5.10	3.80	17.18	0.00	59
Diff-in-Diff			-0.17	-0.99	0.32	59
Diff-in-Diff (with controls)			-0.17	-1.02	0.31	59
				the Netherlands		
Baseline	1.49	0.37	-1.12	-2.75	0.01	19
Follow-up	1.50	1.21	-0.29	-1.14	0.26	19
Diff-in-Diff			0.84	4.50	0.00	19
Diff-in-Diff (with controls)			0.84	5.04	0.00	19
				Belgium		
Baseline	1.48	1.08	-0.40	-1.03	0.30	26
Follow-up	1.51	0.65	-0.86	-3.82	0.00	26
Diff-in-Diff			-0.45	-2.24	0.03	26
Diff-in-Diff (with controls)			-0.45	-2.39	0.02	26
				Spain		
Baseline	1.54	0.80	-0.74	-1.25	0.21	60
Follow-up	1.50	0.87	-0.63	-1.59	0.111	60
Diff-in-Diff			0.11	0.21	0.837	60
Diff-in-Diff (with controls)			0.111	0.21	0.836	60

Notes: The dependent variables for the baseline period refer to the period 2004-2006 in case of the Netherlands and Belgium and 2005-2007 for China and Spain. For the follow-up period the time period is 2007-2009 and 2008-2010. Values are measured as the sum of outcome variables over the respective time period. The number of observations for the baseline and follow-up period is 1336 for each period. Estimates are bootstrapped with 100 replications and based on clustered adjusted standard errors at the country level.

7 Developing an investment support plan

The empirical results provide several implications for policy makers on the design of an investment support plan. Although only weakly significant, first priority should be improvement of investment and business climate factors. There is progress in some areas (reduction of entry costs); however, there is deterioration in other areas of business regulations (strength of investor protection, costs of enforcement of contracts). Despite recent reforms, the general level of taxes (labour taxes plus social security contributions plus other taxes minus allowable deductions and exemptions) is significantly higher than that of other advanced EU countries with similar size and GDP per capita (12 percentage points when expressed as a share of commercial profits). Improving business climate factors would make Austria more attractive for foreign direct investment. Unit labour costs, corporate taxes and the general tax level are significant drivers of Greenfield foreign direct investment in advanced EU/OECD countries. This also holds true for advanced countries.

Direct investment subsidies are primarily targeted at small firms, microenterprises and young firms or firms in less developed areas in Austria. This type of subsidy makes it possible to target specific investments (environmental investments). Further, the possible additionality effect might be large (Table 28).

Table 28: Advantage and disadvantages of direct investment subsidies

	Direct investment subsidies
Advantages	possible to target specific investments
	additionality might be large
	lagging regions can be targeted
Disadvantages	target nonprofitable enterprises
	government involvement in the private firm decision process
	cost control
	large firms cannot be supported
	long decision lags
	high administrative costs

Disadvantages include that large firms in developed regions cannot be supported, thus creating discrimination. Second, there might be long decision lags and high administrative costs. These investment subsidies are important to foster structural change. In recent years the direct investment subsidy level (defined as the net present value of investment subsidies to private corporate investment) has declined significantly, reaching historically low levels (1.3 per cent of private investment as compared to 2.6 per cent before the economic and financial crisis). Public funds of about EUR 100 million would be needed to again reach the level of investment subsidies before the economic and financial crisis in 2008. Second priority should be providing the funding agency with the necessary funds.

Existing instruments of indirect investment support (investment tax credits, more generous depreciation allowances, reductions in corporate taxes) have advantages and disadvantages (Table 29 to Table 31). In general, SMEs and start-ups with no taxable profits do not profit from ITC and changes in the depreciation regime. Investment tax credits are often only feasible with exemptions (e.g. exclusion of transport equipment, short lived equipment)

while changes in depreciation regimes are complicated. Studies attempting to evaluate the effectiveness of these measures have yielded mixed results.

Table 29: Advantage and disadvantages of the investment tax credit

	Investment tax credit (permanent)
Advantages	increase after tax return to investment
	high effectiveness in stimulating investment
	short implementation time
	encourage investment in new equipment that is more productive than the old one
	time lag between introduction and increase in investment is short
	favour the composition towards equipment
	simplicity
	large subsidy in the first year of introduction
	most effective in the short run
Disadvantages	startup firms and SMES with no taxable profits do not benefit
	investment tax incentive raises the price for capital goods
	include all types of equipment (including those who do not generate output)
	favours short lived investments
	does not work without exemptions
	no cost control (about the tax loss)
	non-profit organisations do not benefit
	possible overinvestment at the expense of labour
	additionality may be low in some cases (may stimulate reward investment only)
	large tax loss (->exemptions leads to high administrative costs)

Table 30: Advantage and disadvantages of more generous depreciation allowance

	More generous depreciation allowance (permanent)
Advantages	long tradition
	large tax savings for large/profitable capital intensive companies
	neutral with respect to the durability of capital
	favour equipment
	tax loss can be relatively low (shift over time)
Disadvantages	startup firms and SMEy with no taxable profits do not benefit
	SMEs benefit to a smaller extent
	longer reaction lag
	raises the price for capital goods
	relatively complicated
	considerable complexity to the tax law if used as temporary measure
	Incentive effect is small for equipment with already high depreciation rates
	"bonus depreciation did not appear to be very effective in providing short-term economic stimulus (Gravelle, 2015)"

Table 31: Advantage and disadvantages of reduction in the corporate tax rate

	Reduction in corporate taxes
Advantages	no administrative costs for Governments and firms
	mimimum intervention
	simplicity
	signaling effect is large
	increase the attractiveness for FDI
Disadvantages	low effectiveness: may to necessarily stimulate investment
	effect might be low, firms may believe that taxes rise again

Source: Gravelle, 1993, 2015.

In Austria it seems to be that the bonus depreciation introduced between 2009 and 2010 was more successful in stimulating investment than the incremental tax credit from 2002 to 2004 ("10 prozentige Investitionszuwachsprämie"). A bonus depreciation regime should be re-considered as a temporary investment support measure in periods with declining economic growth.

Lowering corporate tax rates has a number of advantages such as no administrative costs for governments and firms, minimum intervention, simplicity, large signaling effect and increase in the attractiveness for FDI. However, the downside is low effectiveness, i.e. lower corporate taxes may not necessarily stimulate investment. Firms may also believe that such tax cuts are temporary and taxes will rise again. Moreover, lower tax rates for SMEs can discourage their growth when small business owners try to keep reported income below certain thresholds to take advantage of the preferential tax treatment of small businesses (Hendricks, Amit and Whistler, 1997).

Since the structure of investment is changing towards intangible assets, different instruments for different asset types have to be considered. Thus third priority is developing an action plan to increase investment in intellectual property products. The shift from physical to intangible investment is also a main policy proposal in the WWWforeurope project. Investment in IP can be found in all industries, unlike R&D activities which are mainly conducted by manufacturing firms. A strategy to raise IP investment would be beneficial for a large number of firms and is not limited to a small sample of R&D doing firms. Thus intellectual property products exhibit a general purpose character similar as information and communication technologies. Preliminary estimates show that an increase in investment in IPP to that of the leading European countries would induce an increase in real GDP growth by 0.3 percentage points. The introduction of a patent/IP box is unlikely to be sufficient to achieve this goal. A comprehensive strategy is needed to strengthen Austria's position as an attractive location for intellectual property.

Fourth priority should be development of an "Austrian patent/IP/knowledge box tax regime" which should also be part of the investment support plan. This plan should be ready for implementation and ratification when needed. Urgent action is required when the remaining innovation leaders in the world (e.g. US, DE and SE) decide to introduce such a regime. An appropriate design of the patent/IP box could encourage Austrian firms to invest in Austria instead of locating R&D elsewhere. The Austrian government has to take action to formulate such a plan (together with auditors and academics). The plan should include an estimate of a cost benefit analysis with an estimate of possible tax losses and possible effects.

An Austrian patent /IP box tax regime plan should be proposed following the OECD modified nexus approach. The plan should contain details about the type of intellectual property products and the level of the reduced tax rate. A broad definition of IP including software, databases, business know-how, copyrights, designs, and (secret) industrial production or fabrication processes, formulas and trademarks should be considered because of possible spillover effects to other firms. The introduction of such a regime can be regarded as an important step in implementing the EU 2020 strategy. A broad definition of IP in such an IP box regime would indirectly also provide innovation incentives for the "Creative industries". Restricting the patent/IP tax regime on patents is by far to narrow. Income from innovation output should only be eligible for tax exemption when the underlying innovations are generated by domestic R&D activities. This is difficult to monitor and perhaps not consistent with EU law.

The fifth priority is support to complementary factors of IP investment. This includes an increase in the skilled labour supply, and a higher supply of engineers, natural scientists and technicians.

Sixth priority should be closing the actual and expected gap in effective average corporate taxes to that of other advanced European countries. Investment support measures have to be evaluated using qualitative and

quantitative methods. Little is known about the effectiveness of past investment support measures.

Introduction of a patent box would an important signal in achieving higher investment in knowledge intensive assets. It would also be consistent with the EU 2020 strategy that is broader than previous growth strategies, such as the Lisbon Strategy or European Council, since it focuses not only investments in narrow segments, such as R&D and ICT but also in knowledge intensive assets in general. The services factor would particularly benefit from a patent box because of the dominance of non technological innovations and non-R&D based innovations.

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Appendix

Table A32: Poisson Pseudo maximum likelihood (PPML) estimates of the determinants of bilateral Greenfield FDI flows in the EU-27 countries (marginal effects)

	(i)			(ii)			(iii)		
	marg eff		z	marg eff		z	marg eff		z
host log GDP in EUR country, t-1	3.66		1.59	4.14	**	1.69	3.02		1.20
source log GDP in EUR country, t-1	3.21	***	3.25	3.20	***	3.23	3.21	***	3.26
host effective average corporate tax rate, t-1	-12.46	***	-2.97	-12.78	***	-3.07	-11.80	**	-2.79
host log hourly wages costs, t-1	-3.96	*	-1.91	-4.53	**	-2.00	-3.76	*	-1.76
host log share of tertiary education, t-1	2.73	*	1.91	2.47	*	1.71	2.93	**	2.03
parent log share of tertiary education, t-1	3.14	**	2.29	3.05	**	2.25	3.08	**	2.26
parent log R&D/GDP ratio, t-1	4.09	***	3.89	4.03	***	3.86	4.09	***	3.89
GDP per capita dissimilarity, t-1	4.03	***	3.41	4.03	***	3.41	3.99	***	3.34
new EMU members 2007, 2008, 2009				2.11	***	4.21			
new EU members 2007							0.83	**	2.39
log distance	0.24		0.36	0.24		0.37	0.22		0.35
contiguity	2.12	*	1.91	2.12	*	1.90	2.13	*	1.92
common language	1.15		1.52	1.17		1.55	1.13		1.50
former colony	1.55		1.41	1.54		1.41	1.55		1.41
time dummy 2004	0.37		1.03	0.38		1.06	0.38		1.06
time dummy 2005	0.32		0.85	0.34		0.89	0.37		0.95
time dummy 2006	-0.29		-0.64	-0.27		-0.59	-0.20		-0.43
time dummy 2007	-0.83	*	-1.68	-0.82	*	-1.66	-0.76		-1.51
time dummy 2008	-0.85	*	-1.77	-0.86	*	-1.74	-0.74		-1.47
time dummy 2009	-1.84	***	-3.85	-1.85	***	-3.78	-1.73	***	-3.50
time dummy 2010	-2.04	***	-4.02	-2.01	***	-3.92	-1.98	**	-3.82
host country effects	yes			yes			yes		
source country effects	yes			yes			yes		
R^2	0.44			0.43			0.42		
# of obs	5459			5459			5459		
# of country-pairs	702			702			702		

Notes: The dependent variable is the log of bilateral Greenfield FDI flows (plus EUR1) from country i to country j in current EUROs. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are clustered by host countries.

Table A33 Poisson pseudo maximum likelihood (PPML) estimates of the determinants of bilateral Greenfield FDI flows in the EU member states for different groups of parent countries

	EU-15 countries (i)			EU-12 countries (ii)		
	marg eff		z	marg eff		z
host log GDP in EUR host country t-1	7.11		1.00	1.85		1.33
parent log GDP in EUR parent country t-1	4.06	***	3.34	9.75	***	19.11
host effective average corporate tax rate t-1	-15.16	**	-2.55	-7.98	*	-1.95
host log hourly wages costs t-1	-4.73		-0.96	-2.92	***	-3.19
host log tertiary graduates rate t-1	4.03	*	1.92	1.84		1.44
log distance	7.95		1.50	-2.92	***	-5.60
contiguity	8.26	*	1.68	-3.03	***	-5.12
common language	2.45	*	1.70	1.94	**	2.54
colony	-6.24	**	-6.06	4.46	*	1.95
time dummy 2004 (ref. category 2003)	0.73		1.21	0.24		0.81
time dummy 2005	0.56		0.82	0.09		0.24
time dummy 2006	-0.48		-0.66	-0.37		-0.81
time dummy 2007	-0.82		-0.89	-1.32	**	-2.29
time dummy 2008	-0.83		-0.75	-1.62	**	-2.39
time dummy 2009	-1.79		-1.63	-2.16	**	-2.46
time dummy 2010	-1.86	**	-2.31	-1.78	**	-2.39
time dummy variables	yes			yes		
host country effects	yes			yes		
source country effects	yes			yes		
R^2	0.26			0.20		
# of observations	3120			2470		
# of country-pairs	390			312		
# of host countries	15			12		

Notes: The dependent variable is the log of bilateral Greenfield FDI flows (plus EUR1) from country i to country j in current EUROs. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are clustered by host countries.

Table A34 Fixed-effects negative binomial regression model of the determinants of the FDI in intangible assets

	Coef.		z	marg eff.		z
log GDP in const. ppp, host country,t-1	0.33	***	2.97	1.62	***	3.09
log GDP in const ppp., parent, t-1	0.29	***	3.03	1.43	***	3.38
log hourly wages costs, host t-1	-0.05		-0.40	-0.23		-0.40
log hourly wages costs, parent t-1	0.30	*	1.86	1.46	*	1.83
share of tertiary education, parent t-1	0.04	***	2.68	0.17	**	2.35
share of tertiary education, host t-1	0.03	**	2.36	0.17	**	2.07
strength of investor protection, host t-1	0.87	**	2.02	4.25	*	1.91
yr2008	-0.06		-1.24	-0.27		-1.24
yr2009	-0.25	***	-5.03	-1.14	***	-4.05
yr2010	-0.24	***	-4.33	-1.07	***	-3.58
yr2011	-0.14	**	-2.31	-0.64	**	-2.22
constant	-6.56	***	-4.73			
number of observations	2682					
number of host-parent country pairs	559					

Notes: The dependent variable is the number of Greenfield FDI projects in intangible assets from country *i* to country *j*. ***, **, and * denote statistical significance at the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table A35 Ordered probit estimations of the ratio of investment in intangible assets to revenues by type (Austria 2011).

	training			software			Company reputation branding		
	coeff		z	coeff		z	coeff		z
log employment	0.54	***	3.60	0.17		1.08	0.65	***	4.20
young <5yrs	0.02		0.10	-0.31		-1.49	0.48	**	2.53
log Sales per employees	0.00		-0.23	0.00		-0.14	0.00		0.25
Electricity, gas, steam (ref. man)	-0.69		-1.06	0.32		0.50	0.21		0.34
Construction	0.41	**	1.99	0.04		0.20	0.14		0.67
Wholesale & retail trade	0.32		1.59	0.06		0.28	0.58	***	2.79
Transportation & storage	0.19		0.64	0.04		0.12	0.00		0.00
Accommodation & food scvs	0.00		0.00	-0.20		-0.57	0.19		0.54
Information & communication	0.75	***	2.70	0.86	***	3.01	0.22		0.78
Financial & insurance	0.47		1.00	-0.46		-0.85	-0.32		-0.64
Real estate activities	-0.01		-0.02	0.21		0.40	-0.24		-0.43
Professional, scientific, tech. scvs	0.30		1.19	0.44	*	1.68	0.32		1.27
Administrative & support scvs	-0.03		-0.10	0.79	**	2.45	0.55	***	1.70
Arts, entertainment & recreation	-0.03		-0.06	0.20		0.35	0.86		1.58
foreign subsidiary	0.04		0.13	0.25		0.87	0.14		0.48
Pseudo R2	0.03			0.03			0.04		
# obs	284			283			281		
	R&D activities			Design of products and services			Organization or business process improvements		
	coeff		z	coeff		z	coeff		z
log employment	0.60	***	3.53	0.45	***	2.88	0.30	**	2.01
young <5yrs	0.45	**	2.15	0.10		0.53	0.05		0.27
log Sales per employees	0.00		0.30	-0.01		-0.95	-0.02	*	-1.78
Electricity, gas, steam (ref. man)	-1.02		-1.38	0.05		0.08	-0.43		-0.69
Construction	-0.67	***	-3.00	0.07		0.34	-0.21		-1.02
Wholesale & retail trade	-0.75	***	-3.34	0.08		0.37	-0.05		-0.25
Transportation & storage	-1.13	***	-3.19	0.09		0.30	-0.03		-0.10
Accommodation & food scvs	-1.92	***	-3.30	-0.18		-0.44	0.45		1.38
Information & communication	-0.04		-0.12	0.69	**	2.44	0.03		0.12
Financial & insurance	-0.85		-1.56	0.31		0.66	0.15		0.33
Real estate activities	-0.97		-1.49	-0.25		-0.46	-0.72		-1.37
Professional, scientific, tech. scvs	-0.32		-1.18	0.12		0.45	0.13		0.50
Administrative & support scvs	-0.08		-0.24	0.12		0.35	0.38		1.19
Arts, entertainment & recreation	-0.15		-0.25	0.41		0.74	1.42	***	2.47
foreign subsidiary	0.02		0.06	-0.22		-0.71	-0.18		-0.59
Pseudo R2	0.08			0.02			0.03		
# obs	285			269			278		

Source; European Commission, Intangible assets survey.