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International Conference on Economics
Turkish Economic Association
ICE-TEA 2016
Announcement and Call for Papers

The Turkish Economic Association (TEA) is pleased to announce its 5th International Conference on Economics, ICE-TEA, scheduled for **20-22 October 2016** at the **Kefaluka Resort Hotel Bodrum, Turkey;** http://www.kefaluka.com

The main theme of the conference is **"Inclusive and Sustainable Growth and Income Distribution"**. The conference, which is supported by the **International Economic Association,** aims to generate a debating ground for economists from around the world through invited and contributed sessions.

Contributed papers to be presented at ICE-TEA 2016 will be selected on the basis of an abstract submitted at the Abstract Submission page of the conference website; http://teacongress.org The Organization/Scientific Committee welcomes submissions from all fields of economics.

Papers selected from among those accepted on 15 August 2016, submitted in full until 26 September 2016, and presented at the conference will be published in **"Ekonomi-tek"** http://ekonomitek.org , the peer reviewed journal of the TEA. In addition, a proceedings volume will be prepared containing the full papers submitted.

The conference will also provide an opportunity for a tour of the historical sites in the Aegean region at exclusive rates. Information on registration, reservations, transportation alternatives and tours are available at http://teacongress.org

Deadline for Abstract Submission: 20 July 2016

Deadline for Organizing a Session: 20 July 2016

Date of Notification of Acceptance: 15 August 2016

Deadline for Early Registration, Hotel and Flight Reservation: 2 September 2016

Deadline for Submission of Full Paper: 26 September 2016

Date of Announcement of Programme: 30 September 2016

The Turkish Economic Association looks forward to meeting you at ICE-TEA on 20-22 October 2016. We will much appreciate if this announcement is passed on to your colleagues and members.

With best wishes,

Organization/Scientific Committee

Uluslararası Ekonomi Konferansı
Türkiye Ekonomi Kurumu
UEK-TEK 2016
Duyuru ve Bildiri Daveti

Türkiye Ekonomi Kurumu (TEK), Beşinci Uluslararası Ekonomi Konferansı UEK-TEK'i **20-22 Ekim 2016** tarihlerinde **Bodrum**'da **Kefaluka Resort Otel**'de düzenlemektedir; http://www.kefaluka.com

Konferans'ın ana teması **"Kapsayıcı ve Sürdürülebilir Büyüme ve Gelir Dağılımı"**dır. Uluslararası Ekonomi Birliği'nin (**International Economic Association**) desteklediği bu konferansın amacı, tüm ülkelerdeki iktisatçılar için, davet edilmiş ve seçilmiş bildirilerin sunulduğu oturumlar yoluyla, tartışma ortamı yaratmaktır.

UEK-TEK 2016'da sunulacak bildiriler, http://teacongress.org adresindeki konferans web sitesinin Özet Teslimi sayfasından iletilen özetler içinden seçilecektir. Özet ve bildiriler İngilizce veya Türkçe olabilir. Düzenleme/Bilim Kurulu, iktisadın her alanından gelecek özetleri teşekkürle karşılar.

15 Ağustos 2016'da kabul edilmiş, 26 Eylül 2016'ya kadar tam makale olarak teslim edilmiş, ve konferansta sunulmuş bildiriler içinden seçilmiş olanlar, **"Ekonomi-tek"** http://ekonomitek.org dergimizde yayınlanacaktır. Ayrıca, teslim edilen tam makaleleri içeren bir konferans kitabı da hazırlanacaktır.

Konferans, Ege bölgesinin tarihi mekanlarını çok uygun fiyatlarla gezip görebilmek için de bir fırsat sunmaktadır. Kayıtlar, rezervasyonlar, ulaşım seçenekleri ve turlara ilişkin bilgiler http://teacongress.org adresinde duyurulmaktadır.

Özet Teslimi İçin Son Tarih: 20 Temmuz 2016
Oturum Düzenleme İçin Son Tarih: 20 Temmuz 2016
Özet Kabul Bildirim Tarihi: 15 Ağustos 2016
Erken Kayıt, Otel ve Uçak Rezervasyonu İçin Son Tarih: 2 Eylül 2016
Makale Teslimi İçin Son Tarih: 26 Eylül 2016
Programın İlan Tarihi: 30 Eylül 2016

Türkiye Ekonomi Kurumu olarak 20-22 Ekim'de UEK-TEK 2016'da sizi de aramızda görmekten sevinç duyacağız. Lütfen bu duyuruyu diğer meslektaşlarımıza ve bölümünüz mensuplarına iletiniz.

En iyi dileklerimizle.

Düzenleme/Bilim Kurulu

Editor's Introduction

This issue of *Ekonomi-tek* starts off the fourth volume of our publication and contains three papers on particularly important topical subjects, namely, foreign direct investment, the employment effect in Turkey of the minimum wage, and immigration flows to and from OECD countries. These three topics just happen to be among those that have recently been at the top of the agenda of economic and policy debates here in Turkey.

The first paper is by Yılmaz Akyüz, of the South Center and UNCTAD. His stimulating contribution reviews the debates and key issues surrounding foreign direct investment (FDI) against the backdrop of industrialization and economic development. After clearing up several widespread misunderstandings of the very definition of FDI, he goes on to explain exactly how FDI fosters domestic investment, provides a stable source of external financing, adds to productive capacity, and accelerates technological progress, structural change, and industrial upgrading—all of which are obviously desirable outcomes in any emerging market economy.

However, Akyüz expresses his significantly differing view from the mainstream economics approach when he delivers his conclusion on the matter: FDI is far from being a fail-safe strategy to ensure rapid and sustained economic growth, in tandem with steadily proceeding industrialization, for a developing country. To guarantee a truly positive contribution to a nation's growth and industrialization, FDI policy needs to be embedded in the government's overall industrial strategy. The paper considers which policies would be best at yielding such advantageous spillovers from FDI; at the same time, it concedes that constraints to good policymaking in this area may stand in the way. Often, these roadblocks are self-inflicted by developing-country governments that earlier decided to sign investment and free-trade agreements with the advanced countries as well as agreements signed with the WTO.

Our second paper in this issue is by Selin Pelek, of Galatasaray University. This paper outlines her investigation of the employment effects of minimum wages in Turkey. Cross-sectional data for 26 regions cover the period between 2004 and 2014. The focus is mainly on how the minimum age interacts with youth employment, specifically those between the ages of 15 and 29. In esti-

mations, both formal and informal employment as well as education levels of the workers are taken into consideration.

Her major findings are as follows: (i) The minimum wage does not hurt total employment in the 15-29 age group, for the most part. (ii) However, when it comes to informal employment, this age group is affected by changes in the minimum wage. (iii) Informal wage employment rises in response to increases in the minimum wage; employment of not only minimally educated workers but also of medium educated ones are boosted.

The third paper is by Cansu Ünver, of the University of Birmingham. The author explores the role of ICT (Information and Communications Technology) connections on migration flows. The effects of a number of other variables, including the employment rate in the host country and the unemployment rate in the origin country, real GDP per capita, the average wage in the host country, and the distance between the origin and host countries, are also tested. Intra-OECD population movements, as well as movements from the non-OECD regions to the OECD ones, are also covered.

The empirical work in this paper draws on panel data of migration flows of the 15-64 age group from origin countries to host countries, covering the years between 1995 and 2009. Among the main host countries are Austria, Belgium, France, Germany, Italy, Spain, and the UK. OECD-origin countries include, among others: Estonia, Slovakia, and Turkey. Among the non-OECD-origin countries, on the other hand, there are, for instance, Algeria, Armenia, Bulgaria, China, Egypt, Morocco, Nigeria, Pakistan, Romania, Tunisia, and Ukraine. The author reports that the broadband penetration rate has a significant and positive effect on migration flows. This effect is stronger for non-OECD migration flows. Also, broadband seems to be preferred over landline phones by potential migrants.

We look forward to presenting you with more thought-provoking articles in our future issues.

Ercan Uygur
Editor
Ekonomi-tek

Editörün Sunuşu

Ekononomi-tek'in bu sayısı dergimizin dördüncü cildini başlatıyor ve önemli güncel özellikleri de olan doğrudan yabancı yatırım, Türkiye'de asgari ücretin istihdam üzerinde etkisi, ve OECD ülkelerine ve bu ülkelerden göç akımları konularında üç makale içeriyor. Bu üç başlık, Türkiye'de ekonomi ve politika konularındaki tartışma gündeminin en üst sıralarında yer almaktadır.

Birinci makale, South Center ve UNCTAD'dan Yılmaz Akyüz'ündür. Yazarın bu dikkat çekici ve uyarıcı katkısı, sanayileşme ve ekonomik kalkınma çerçevesinde yabancı doğudan yatırımla (YDY) ilgili tartışmaları ve temel konuları ele almaktadır. Yazar önce YDY tanımı ile ilgili yaygın yanlış anlamaları ve yorumları açıklığa kavuşturmaktadır. Sonra, gelişmekte olan/yükselen ekonomiler için önemli olan şu konularda geniş açıklamalar yapmaktadır: YDY'nin yurtiçi yatırımları uyarma etkisi, istikrarlı bir dış finansal kaynak olup olmadığı, üretim kapasitesine katkısının derecesi, ve teknolojik gelişme, yapısal değişme ve sanayide iyileşme üzerindeki hızlandırma etkisi.

Ancak, Yılmaz Akyüz konuyu şu sözlerle sonuçlandırırken, ana akım iktisat yaklaşımından oldukça farklı bir görüşte olduğunu göstermektedir: YDY, gelişmekte olan bir ülkenin istikrarlı bir sanayileşme ile birlikte hızlı ve sürdürülebilir büyümesini sağlamak için garantili bir büyüme stratejisi oluşturmaktan uzaktır. Bir ülkenin büyüme ve sanayileşmesine gerçekten olumlu katkısını garanti etmek için, YDY'nin hükümetin genel sanayileşme stratejisi çerçevesi içinde yer alması gerekir. Makale, YDY'nin olumlu yayılma etkisi yapabilmesi için, hangi politikaların en yararlı olduğunu ele almaktadır; aynı zamanda bu alanda doğru politika oluşturmakta bazı kısıtların ve engellerin olduğunu da kabul etmektedir. Bu engeller birçok zaman gelişmekte olan ülke hükümetlerinin, gelişmiş ülkelerle daha önce imzaladıkları yatırım ve serbest ticaret anlaşmaları yoluyla, kendileri tarafından getirilmekte, Dünya Ticaret Örgütü (WTO) anlaşmaları da ayrıca olumsuz kısıtlar getirmektedir.

Bu sayıdaki ikinci makalemiz Galatasaray Üniversitesi'nden Selin Pelek tarafından yazılmıştır. Bu makalede yazar, Türkiye'de asgari ücretin istihdam üzerindeki etkilerini araştırmaktadır. Araştırmada kullanılan veriler 26 bölgeyi ve 2004 ile 2014 dönemini kapsamaktadır. Makale, asgari ücretin genel olarak gençlerin istihdamı, özellikle de 15 ile 29 yaş arasındakilerin istihdamı ile nasıl bir etkileşim içinde olduğu üzerinde yoğunlaşmaktadır. Yapılan ekonometrik tahminlerde, kayıtlı ve kayıtdışı istihdam yanında işçilerin eğitim düzeyleri de dikkate alınmaktadır.

Makaledeki başlıca bulgular şunlardır; (i) Asgari ücret artışlarının genel olarak 15-29 yaş grubundaki gençlerin toplam istihdamı üzerinde olumsuz etkisi yoktur. (ii) Ancak, asgari ücret artışlarının kayıtdışı istihdam üzerinde aynı yönde etkisi vardır. (iii) Asgari ücrette yükselmeler, kayıtdışı istihdamda artış getirmekte; kayıtdışı istihdam artışı eğitim düzeyi düşük ve orta düzeyde olan işçilerde daha fazla görülmektedir.

Üçüncü makale, Birmingham Üniversitesi'nden Cansu Ünver'in makalesidir. Burada yazar, göç akımları üzerinde BİT (bilgi ve iletişim teknolojisi) bağlantılarının rolünü araştırmaktadır. Göç alan ülkede istihdam oranı, göç veren ülkede işsizlik oranı, kişi başına reel GSYİH, göç alan ülkede ortalama ücret, göç alan ve veren ülkeler arasındaki uzaklık gibi başka değişkenlerin de göç akımı üzerindeki etkileri sınanmıştır. OECD içi nüfus hareketleri yanında OECD dışından OECD'ye olan akımlar da kapsanmıştır.

Bu makaledeki uygulamalı çalışmalar ve tahminler, 15-64 yaş grubundaki kişilerin göç veren ülkelerden göç alan ülkelere olan akımını yansıtan ve 1995 ve 2009 yılları arasındaki dönemi kapsayan panel verileri ile yapılmıştır. Göç alan ülkeler arasında Almanya, Avusturya, Belçika, Birleşik Krallık, Fransa, İspanya ve İtalya vardır. Göç veren OECD ülkelerinden bazıları Estonya, Slovakya ve Türkiye'dir. Diğer yandan, göç veren OECD üyesi olmayan ülkeler arasında, örneğin, Bulgaristan, Cezayir, Çin, Ermenistan, Fas, Mısır, Nijerya, Pakistan, Romanya, Tunus ve Ukrayna yer almaktadır. Yazar, genişbant (broadband) kanalı haberleşme oranının göç akımları üzerinde olumlu ve anlamlı etkisinin olduğu sonucuna varmıştır. Bu etki, OECD üyesi olmayan ülkeler göçlerinde daha da güçlüdür. Ayrıca, potansiyel göçmenlerin, genişbant haberleşme kanalını, sabit hat telefon haberleşmesine göre daha çok tercih ettikleri görülmektedir.

Gelecek sayılarımızda sizlere yine ilgi çekici, düşündüren ve uyaran makaleler sunmayı diliyoruz.

Ercan Uygur
Editör
Ekonomi-tek

FOREIGN DIRECT INVESTMENT, INVESTMENT AGREEMENTS, AND ECONOMIC DEVELOPMENT: MYTHS AND REALITIES

Yılmaz Akyüz[*]

Abstract

Foreign direct investment (FDI) is one of the most ambiguous and least understood concepts in international economics. Common debate over FDI is confounded by several myths regarding its nature and impact on capital accumulation, technological progress, industrialization, and growth. It is often portrayed as a long-term, stable, cross-border flow of capital that adds to productive capacity, helps meet balance-of-payments shortfalls, transfers technology and management skills, and links domestic firms with wider global markets. However, none of these are intrinsic qualities of FDI.

First, FDI is more about the transfer and exercise of control than movement of capital. It does not always involve flows of financial capital (movements of funds through foreign-exchange markets) or real capital (imports of machinery and equipment for the installation of productive capacity).

Second, only the so-called greenfield investment makes a direct contribution to productive capacity and involves cross-border movement of capital goods, but it is not easy to identify from reported statistics what proportion of FDI consists of such investment as opposed to transfer of ownership of existing assets.

Third, what is commonly reported as FDI contains speculative and volatile components. Fourth, the longer-term impact of FDI on the balance of payments is often negative, even in countries highly successful in attracting ex-

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port-oriented FDI. Finally, positive technological spillovers from FDI are not automatic but call for targeted policies of the kind that most investment agreements prohibit.

Jel Codes: F21, F23, F32, F63, O33

Key Words: Foreign direct investment, balance of payments, growth and development, technological change, transnational corporations

1. Introduction

Foreign direct investment (FDI) is perhaps one of the most ambiguous and least understood concepts in international economics. Common debate over FDI is confounded by several myths regarding its nature and impact on capital accumulation, technological progress, industrialization, and growth in emerging and developing economies (EDEs). It is often portrayed as a long-term, stable, cross-border flow of capital that adds to productive capacity, helps meet balance-of-payments shortfalls, transfers technology and management skills, and links domestic firms with wider global markets.

However, none of these are intrinsic qualities of FDI. First, FDI is more about the transfer and exercise of control than movement of capital. Contrary to widespread perception, it does not always involve flows of financial capital (movements of funds through foreign-exchange markets) or real capital (imports of machinery and equipment for the installation of productive capacity). A large proportion of FDI does not entail cross-border capital flows but is financed from incomes generated on the existing stock of investment in host countries. Equity and loans from parent companies account for a relatively small part of recorded FDI and even a smaller part of total foreign assets controlled by transnational corporations (TNCs).

Second, only so-called greenfield investment makes a direct contribution to productive capacity and involves cross-border movement of capital goods. But it is not easy to identify from reported statistics what proportion of FDI consists of such investment as opposed to transfer of ownership of existing firms (mergers and acquisitions, i.e., M & A). Furthermore, even when FDI is in bricks and mortar, it may not add to aggregate gross fixed-capital formation (GFCF) because it may crowd out domestic investors.

Third, what is commonly known and reported as FDI contains speculative components and creates destabilizing impulses, including those due to the

operation of transnational banks in host countries, which need to be controlled and managed as any other form of international capital flows.

Fourth, the immediate contribution of FDI to the balance-of-payments may be positive, since it is only partly absorbed by imports of capital goods required to install production capacity. But its longer-term impact is often negative because of the high import content of foreign firms and profit remittances. This is true even in countries highly successful in attracting export-oriented FDI.

Finally, superior technology and management skills of TNCs create an opportunity for the diffusion of technology and ideas. However, the competitive advantage these firms have over newcomers in EDEs can also drive them out of business. They can help EDEs integrate into global production networks, but participation in such networks also carries the risk of getting locked into low value-added activities.

All this does not mean that FDI does not offer any benefits to EDEs. Rather, policy in host countries plays a key role in determining the impact of FDI in these areas. A laissez-faire approach could not yield much benefit. It may, in fact, do more harm than good. Successful examples are found not necessarily among EDEs that attracted more FDI, but among those that used it in the context of national industrial policy designed to shape the evolution of specific industries through interventions. This means that EDEs need adequate policy activity vis-à-vis FDI and TNCs if they are to benefit from it.

Still, the past two decades have seen a rapid liberalization of FDI regimes and the erosion of policy autonomy in EDEs vis-à-vis TNCs. This is partly due to the commitments undertaken in the WTO as part of the Agreement on Trade-Related Investment Measures (TRIMs). However, many of the more serious constraints are, in practice, self-inflicted through unilateral liberalization or bilateral investment treaties (BITs)[1] signed with more advanced economies (AEs) – a process that appears to be going ahead with full force, with the universe of investment agreements reaching 3,262 by the end of 2014 (UNCTAD IPM 2015).

Unlike earlier BITs, recent agreements give significant leverage to international investors. They often include rights to establishment, the national treatment and the most-favored-nation (MFN) clauses, broad definitions of investment and investors, fair and equitable treatment, protection from expro-

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[1] In this paper, BITs is used as shorthand for all international agreements signed outside the multilateral system that contain provisions on foreign investment and investors, including free-trade and economic-partnership agreements.

priation, free transfers of capital, and prohibition of performance require-ments. Furthermore, the reach of BITs has extended rapidly thanks to the use of the so-called Special Purpose Entities (SPEs), which allow TNCs from countries without a BIT with the destination country to make the investment through an affiliate incorporated in a third-party state having a BIT with the destination country. Many BITs include provisions that free foreign investors from the obligation of having to exhaust local legal remedies in disputes with host countries before seeking international arbitration. This, together with the lack of clarity in treaty provisions, has resulted in the emergence of arbitral tribunals as lawmakers in international investment, and these tend to provide expansive interpretations of investment provisions in favor of investors, thereby constraining policy further and inflicting costs on host countries.

Only a few EDEs signing such BITs with AEs have significant outward FDI. Therefore, in the large majority of cases, there is no reciprocity in deriv-ing benefits from the rights and protection granted to foreign investors. In-stead, most EDEs sign them on expectations that they will attract more FDI by providing foreign investors guarantees and protection, thereby accelerating growth and development. However, there is no clear evidence that BITs have a strong impact on the direction of FDI inflows. More importantly, these agreements are generally incompatible with the principal objectives of signing them because they constrain the ability of host countries to pursue policies needed to gain their full potential benefits.

This paper revisits and reviews the key issues surrounding the place held by FDI in industrialization and development, with a view to assessing the impact of BITs. It examines if and under what conditions FDI provides a sta-ble source of external financing, supplements domestic resources, adds to productive capacity, and accelerates technological progress and industrial upgrading. It starts with an examination of the concept of FDI as officially defined and reported in order to clarify what it is about. This is followed by a discussion of the effects of FDI on capital accumulation, stability, and the balance-of-payments, and the policies and conditions needed to secure posi-tive technological spillovers from foreign firms. The penultimate section as-sesses and compares the policy constraints implied by the WTO Agreement on TRIMs with those imposed by BITs, followed by brief policy conclusions.

2. What is FDI?

In common discussions, the term FDI is often meant to describe capital in-flows from abroad and additions to productive capacity in host countries. However, the reality is a lot more complex and the concept is a lot more am-

biguous than is widely believed. An important part of FDI does not entail cross-border capital flows, and it is very difficult to identify from existing statistics what FDI really comprises.[2]

The OECD (2008) provides global standards for direct investment statistics consistent with the related concepts and definitions of "Balance of Payments and International Investment Position Manual" of the IMF (2009). Direct investment is defined as a category of cross-border investment made by a resident in one economy (*direct investor*) with the objective of establishing a lasting interest in an enterprise (*direct investment enterprise*) that is resident in an economy other than that of the direct investor. The motivation of the direct investor is said to be a long-term, stable relationship with the direct investment enterprise to ensure a significant degree of influence over its management. The lasting interest and a significant degree of influence are said to be evidenced when the direct investor owns at least 10% of the voting power of the direct investment enterprise. Ownership below 10% is treated as portfolio equity investment.

Defined in this way, FDI comprises the initial equity transaction that meets the 10% threshold and all subsequent financial transactions and positions between the direct investor and the direct investment enterprise. Thus, in addition to initial equity capital outflows from the home country, it includes reinvested earnings and intercompany debt flows.

The threshold of 10% is totally arbitrary, and there is no compelling reason why investment in a 10% ownership stake should be less fickle than one in a 9.9% position. Both the OECD and the IMF recognize that, in practice, influence may be determined by several factors other than the extent of ownership. However, they argue that "a *strict application* of a numerical guideline is recommended to define direct investment" in order to secure international consistency and to avoid subjective judgments.[3]

In the official definition, a direct investment enterprise is always a corporation and may also include public entities. However, contrary to a widespread perception, direct investors are not always TNCs. It could also be an individual or household, an investment fund, a government, an international organization, or a non-profit institution. Certainly, there are significant differences in the technology and managerial skills such diverse investors could bring to the host country. But readily available official statistics do not help in

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[2] For an earlier account of some of the issues taken up here, see Woodward (2001).

[3] The OECD (2008, para 31). See also IMF (2009, para 6.13). Definition and measurement of FDI have changed considerably over time and have varied across countries; see Lipsey (1999).

identifying them. This is one of the drawbacks of empirical studies linking aggregate FDI to various economic performance indicators in host countries, such as GFCF, productivity, and growth.

Every financial transaction after the initial acquisition of equity by the investor, that is, internal capital flows within firms, are also considered direct investment. Thus, loans and advances from parent companies to affiliates are treated as part of direct equity rather than debt. Exceptions are made for loans between certain affiliated financial corporations, notably deposit-taking corporations – international banks – on grounds that such debt is not so strongly connected to direct investment relationships. However, this may also be the case in non-financial enterprises since, in practice, it is not possible to identify the nature and effects of lending and borrowing between parents and affiliated corporations. Statistics do not generally give the terms and conditions of intra-company loans and advances (UNCTAD, 2009a). They are known to fluctuate much more than equity capital. They are highly susceptible to changes in short-term business conditions, and their inclusion as equity capital can cause major swings in recorded FDI flows. "For instance, in 2012, high levels of repayment of loans to parent companies in Brazil by their affiliates abroad pushed total Brazilian FDI outflows to negative figures even though there was a net equity capital investment abroad of some $7.5 billion by Brazilian parent companies."

While initial equity investment and intercompany loans constitute capital inflows to the host country, this is not the case for retained earnings. In FDI statistics, these are imputed as being payable to the owners, to be reinvested as an increase in their equity. Thus, they are assumed to be used for lasting investment in the existing or new productive assets. In balance-of-payments, they are first recorded as investment-income payments in the current account and then as offsetting inflows of direct equity investment in the capital and financial account.

Retained earnings constitute a significant part of statistically measured FDI inflows. Historically, equity capital outflows and net debt from parent companies are relatively small parts of US outflows of direct investment, while the rest comes from retained earnings. In the postwar period until the mid-1990s, the latter accounted for no less than one half of US outward direct investment (Lipsey, 1999). It was even higher in more recent years because of growth of the US outward FDI stock. In 2008, retained earnings constituted 60% of outward FDI stock for non-bank affiliates of US non-bank corporations (Table 1). Globally, in 2011, they accounted for 30% of total FDI flows. This proportion was even higher for FDI in EDEs; in the same year, half of the earnings on

FDI stock in EDEs were retained, financing about 40% of total inward foreign direct investment in these economies (UNCTAD WIR, 2013).

Clearly, when financed from earnings generated in host countries, FDI does not constitute an autonomous source of external financing. Given that retained earnings constitute an important component of total recorded FDI, the notion that FDI is functionally indistinguishable from fresh capital inflows and represents a flow of foreign resources crossing the borders of two countries has no validity, as long noted by Vernon (1999). Equity and loans from parent companies account for a relatively small part of recorded FDI and an even smaller part of total foreign assets controlled by them.

This is illustrated in Table 1 for the majority-owned foreign non-bank affiliates of US non-bank corporations. Figures for 1989 are estimates at current cost given by Feldstein (1994), whereas those for 2008 are based on the 2008 benchmark survey of the US Bureau of Economic Analysis (BOEA, 2008), using the same methodology as Feldstein (1994). In both years, FDI as defined in the balance-of-payments exceeds by a large margin not only equity and loans from parent companies, but also total net external finance from all US sources because of retained profits.[4] More importantly, the value of assets of US affiliates is significantly greater than net finance from US sources because of equity and debt from non-US sources and the share of non-US sources in retained profits of majority-owned US affiliates. In 2008, total assets controlled by US affiliates were 8.6 times the net external finance from US sources (equity and debt from US parents and other US investors) and 3.8 times the stock of US outward FDI at current cost as conventionally defined (that is, including unrepatriated profits).

3. FDI and Domestic Investment

As officially defined, FDI can take three main forms. The first is greenfield investment, which involves creating a subsidiary from scratch with fresh capital by one or more non-resident investors. The second is cross-border M & A, which relates to existing company structures. Cross-border mergers arise when resident and non-resident companies agree to combine into a single operation.

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[4] Feldstein (1994) distinguishes among several definitions of outward FDI. The narrowest definition, net external finance from US sources, includes only outflows of equity and debt from US parents and other US sources. Net finance from US sources is a broader definition and includes, in addition, retained earnings due to US parents and other US investors. The broadest concept refers to total assets controlled by US parents, that is, value of assets of US affiliates, and includes, in addition, equity and debt finance from non-US sources and the share of non-US equity investors in retained earnings.

Table 1. Outward FDI and Value of Assets of US Non-Bank Foreign Affiliates *(Billions of US dollars)*

	1989	2008
FDI (US parents)	**452**	**4376**
Equity	202	1638
Debt	25	130
Retained earnings	225	2608
Other US investors	**24**	**146**
Equity	1	3
Debt	22	138
Retained earnings	1	5
Net external finance from US sources[a]	**250**	**1909**
Net finance from US sources[b]	**476**	**4522**
Non-US finance	**761**	**11910**
Equity	92	2741
Debt	567	4806
Retained earnings	102	4363
Value of assets of US affiliates[c]	**1237**	**16432**

Source: 1989 figures from Feldstein (1994). 2008 figures are estimates from BOEA (2008) using the same method as Feldstein.
a: Equity and debt from US parents and other US investors.
b: FDI plus other US investors.
c: Net finance from US sources plus non-US finance.

Acquisitions involve the purchase of existing companies fully or partly by a non-resident company or a group of companies; that is, a transfer of ownership from residents to non-residents of 10% or more of voting stock of an existing company. The third is the expansion of production capacity of existing firms partly or fully owned by non-residents through the injection of fresh money, including loans from parent companies. When FDI is in the form of acquisition of existing public or private assets, it makes no direct contribution to domestic capital formation, although changes in ownership may give rise to

productivity gains, be followed by new investment by the direct investor, or stimulate domestic investment that would not have otherwise taken place. Cross-border privatization could also add to domestic capital accumulation if the proceeds are used for investment. However, these all depend on several other factors, including host country policies. Moreover, such spillovers may also be generated by greenfield FDI. Thus, M & A cannot be treated at par with the other two components of FDI that directly add to productive capacity in host countries.

These three categories of FDI are not separately identified in the existing statistics on FDI provided by the OECD and the IMF.[5] UNCTAD provides data on M & A as well as greenfield "investment projects" from 2003 onwards, which refer to capital expenditures planned by the investor at the time of the announcement. It is recognized that investment projects data "can be substantially different from the official FDI data as companies can raise capital locally and phase their investments over time, and the project may be canceled or may not start in the year when it is announced" (UNCTAD WIR 2014, p. 33, note 1). A comparison of reported FDI inflows with the sum total of M & A and greenfield projects shows considerable variations over the 2003-13 period. For AEs, figures on total FDI exceed the sum total of the figures on greenfield projects and M & A for every year except 2005. For EDEs, this is the case since 2010, and, in some years, the discrepancy is as high as 40% of reported FDI figures. Given the global economic downturn after 2007, investment plans are unlikely to have been exceeded to the extent that they would account for the discrepancy. This strongly suggests that reported FDI data contain items that may not really qualify as direct investment.

The existing statistical measures cannot always identify the use made of unrepatriated earnings and loans from parents. It is known that they are extensively used to accumulate record levels of cash and other liquid assets, rather than reinvested in productive capacity (UNCTAD WIR, 2013). Certainly, any industrial or commercial enterprise needs to hold liquid capital in order to support its core activities for the production and marketing of goods and services. But it is very difficult to identify from official statistics the proportion of recorded equity capital held in such assets or whether they serve to support core activities, as opposed to constituting an independent source of financial income and speculative capital gains.

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[5] The fourth edition of the OECD Benchmark Definition of FDI contains an updated benchmark definition and provides guidance on how to compile FDI by type and distinguish M&A (OECD, 2008, pp. 141-42). However, collection of data on FDI from member countries according to the new guidelines started only in September 2014 and will not be available before the second quarter of 2015.

All these difficulties in interpreting the reported FDI data as investment in productive capacity are also recognized by UNCTAD (WIR 2014, p.149): "FDI flows do not always translate into equivalent capital expenditures, especially where they are driven by retained earnings or by transactions, such as mergers and acquisitions (M & As), although some M & A transactions, such as brownfield investment in agriculture, do result in significant capital expenditure. FDI can contain short-term, relatively volatile components, such as 'hot money' or investments in real estate."

The contribution of FDI to GFCF depends not only on whether it represents additional capital spending on productive capacity rather than transfer of ownership or portfolio investment, but also on its impact on domestic capital accumulation – that is, whether it crowds in or crowds out domestic investment. The impact can occur in various channels. FDI inflows attracted by privatization could allow public investment to be raised. Again, it can affect domestic investment by easing the balance-of-payments constraint. Whether FDI crowds in or crowds out domestic investors also depends on the externalities and spillovers generated by foreign companies. They can stimulate domestic investment if they help improve overall economic performance through linkages with the domestic industry and technological and managerial spillovers. However, such benefits are not automatic. In the absence of deliberate and effective policies to generate positive spillovers, the financial and technological strengths of these firms can simply crowd out domestic investors.

The empirical evidence for the impact of FDI on aggregate domestic investment is inconclusive and the impact is often related to other variables, including institutions and policy (Akyüz, 2006; Morrissey and Udomkerdmongkol, 2012; Farla *et al*., 2013). Results also differ across regions, with East Asian EDEs mostly showing crowding-in, while Latin America displays crowding-out.[6] Most of these studies do not distinguish between acquisition of existing assets and greenfield investment. A study examining the impact of M & A separately concludes that M & A-related FDI is not only less beneficial than greenfield investment, but also has an adverse effect on accumulation and growth (Nanda, 2009). The evidence of the impact of outward FDI on domestic investment in home countries is also mixed. One of the first studies of this by Feldstein (1994), using data from the US for the 1970s and 1980s, concluded that outbound FDI reduced domestic investment about dollar for

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[6] Looking at Africa, Asia, and Latin America, Agosin and Machado (2005) find that the impact of FDI on domestic investment is at best neutral in all regions, with Latin America showing a crowding-out effect. See also Ernst (2005) on crowding out in the three largest economies of Latin America. The evidence provided by Mutenyo *et al*. (2010) suggests that FDI also crowds out private investment in sub-Saharan Africa.

dollar, whereas inbound FDI raised domestic investment by the same magnitude.

A more recent study of OECD countries, using data from the 1980s and 1990s, came to the same conclusion for aggregate domestic investment and outward FDI (Desai *et al*., 2005). However, when the analysis was confined to domestic and outward investment by TNCs, investment by American multinationals and their foreign affiliates appeared complementary. Research also suggests that the relation between domestic investment and outward FDI may be sector specific, with those with strong R&D components appearing to be complementary compared to efficiency-seeking FDI (Goedegebuure, 2006). With increased outward FDI from some major EDEs, attention has recently turned to the impact of such investment on domestic capital accumulation in these economies. A study using aggregate domestic investment and outward FDI data from 121 countries, including both developing and transition economies, over the 1990-2010 period found that outward FDI in these countries had a negative effect on domestic investment (Al-Sadig, 2013).

The rapid growth of global FDI in the past three decades appears to have led not so much to an acceleration of global capital accumulation as to a reallocation of production facilities, jobs, and ownership across different countries. For the world economy as a whole, total FDI inflows as a proportion of GDP increased more than three-fold since the 1980s, while the investment ratio declined over the same period (Table 2). During this period, FDI inflows grew rapidly in both AEs and EDEs, but investment fell in the former while rising in the latter. In AEs in both the 1990s and 2000s, higher FDI inflows were associated with lower domestic capital accumulation. While the acceleration of FDI inflows to EDEs was associated with a rise in domestic investment in the new millennium, this was not the case in the 1990s.

Table 2. Investment and FDI *(Per cent of GDP)*

	Investment[a]			FDI Inflows		
	1981-1990	1991-2000	2001-2013	1981-1990	1991-2000	2001-2013
World	24.4	23.4	23.6	0.64	1.71	2.29
AEs	24.3	23.2	21.3	0.65	1.57	1.90
EDEs	24.4	24.4	28.4	0.59	2.19	3.12

Source: IMF *World Economic Outlook* (October 2014) and UNCTAD *FDI* database.
a: Includes inventories

In the 1990s, the privatization of public assets played an important role in the boost in FDI inflows, particularly in Latin America, which received two-thirds of total FDI inflows to EDEs linked to privatization (UNCTAD TDR, 1999). After a series of financial crises in EDEs starting in the mid-1990s, most forms of capital inflows, notably bank lending, fell sharply, but FDI kept up. An important factor was foreign acquisition of companies in EDEs hit by the crises. This happened particularly during the Asian crisis, where massive flight of short-term capital and sale of foreign equity holdings were accompanied by a wave of FDI inflows in the form of foreign acquisition of Asian firms. Collapse of currencies and asset price deflation, together with the pressure from the IMF to abandon policies unfavorable to foreign ownership, created opportunities for TNCs to buy Asian companies at fire-sale prices (Krugman, 2000). Indeed, cross-border M & A as a percent of total FDI peaked during the recurrent crises in EDEs at the end of the 1990s and early 2000s (Chart 1). Foreign acquisitions at times of crises in host countries are driven mainly by non-financial acquirers targeting firms in the same industry, thereby concentrating market power in TNCs at the expense of national companies of EDEs (Alquist *et al.*, 2013).

Chart 1. Share of Cross-border M&A as per cent of Total FDI Inflows in Developing Countries[a] *(Per cent)*
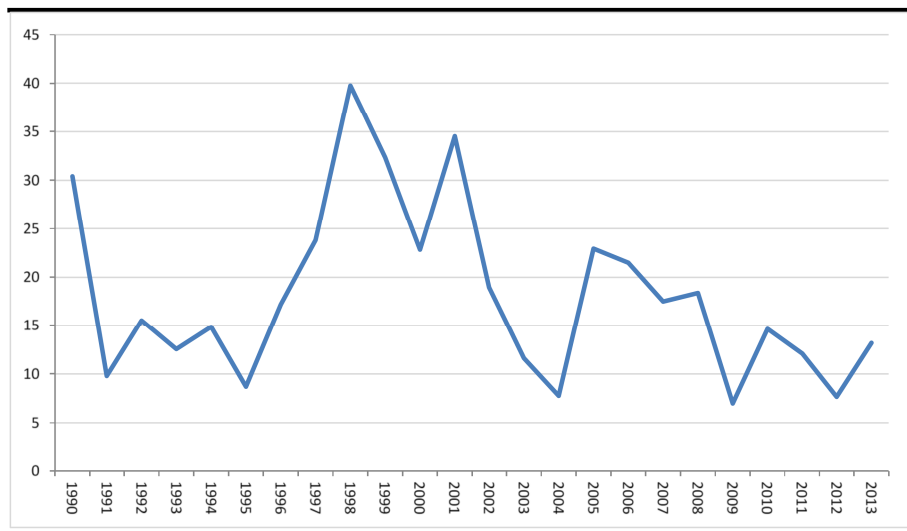
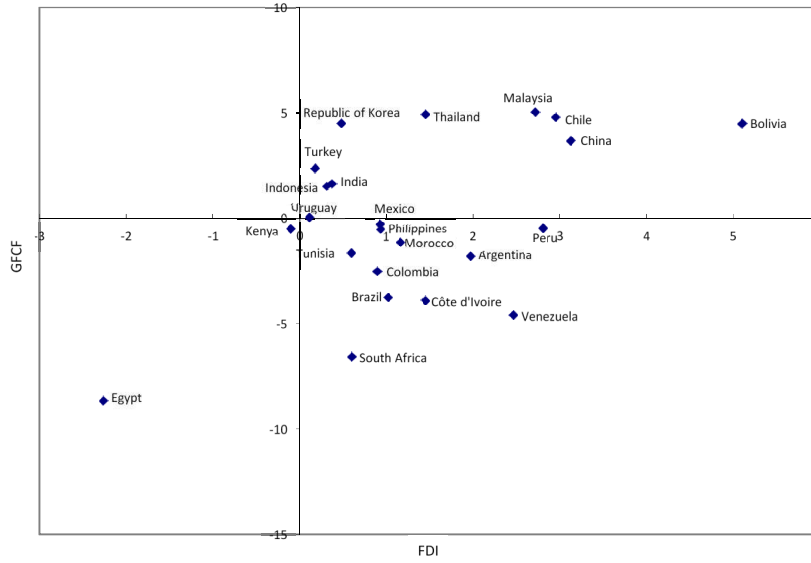**Source**: UNCTAD *WIR* (2014).
a: excludes China

This suggests that the economic conditions that attract foreign enterprises may not always be conducive to faster capital formation and that the two sets of investment decisions may be driven by different considerations. Indeed, the generalized surge in FDI inflows to EDEs in the 1990s was not always accompanied by a concomitant increase in domestic capital formation. In Latin America, there was a widespread pattern of increased FDI combined with reduced fixed-capital formation; for the region as a whole, FDI as a proportion of GDP was higher in the 1990s than in the 1980s by more than 1.7 percentage points, but the share of GFCF in GDP was lower by some 0.6 percentage point (UNCTAD TDR, 2003). In all major Latin American economies, FDI as a proportion of GDP rose strongly, while GFCF either stagnated or fell between the two periods (Chart 2). It is also notable that the inverse association between GFCF and FDI is found not only in countries where a substantial portion of FDI was in the form of M & A, but also in Mexico, where there was considerable greenfield investment stimulated by NAFTA. Again, in several countries in Africa, FDI and GFCF moved in opposite directions. By contrast, in none of the rapidly growing East Asian NIEs was rising FDI associated with falling GFCF.

In the new millennium, in EDEs as a whole, both FDI inflows and investment as a percentage of GDP grew strongly until the global crisis, but they departed subsequently, with FDI falling while investment kept up, thanks largely to fiscal stimulus packages introduced in response to fallout from the crisis (Chart 3). In 2012, they were both significantly higher than the levels recorded in the early years of the century. There is, however, considerable diversity among countries. In more than half of the countries that enjoyed booms in FDI inflows, GFCF fell or stagnated, including in Brazil, Korea, Turkey, and Thailand (Chart 2). In China, FDI inflows declined mainly because of contraction in its export markets, while GFCF jumped sharply because of the policy response of the government to ramifications from the crisis: a massive investment package. Among the East Asian countries severely hit by the 1997 crisis, only Indonesia saw a run-up in both FDI and GFCF in the 2000s compared to the 1990s, while Malaysia experienced a sharp contraction in both.

The examination of the movements of capital inflows to EDEs and domestic investment over the past two decades shows that FDI tends to move more closely with non-FDI flows than with domestic investment (Chart 3). From the mid-1990s until the end of the decade, there was an inverse correlation between FDI and domestic investment.

Chart 2. Changes in FDI Inflows and Domestic GFCF in Selected Emerging Economies *(Per cent of GDP)*

1990-2000 compared to 1980-1990:

2000-2012 compared to 1990-2000:
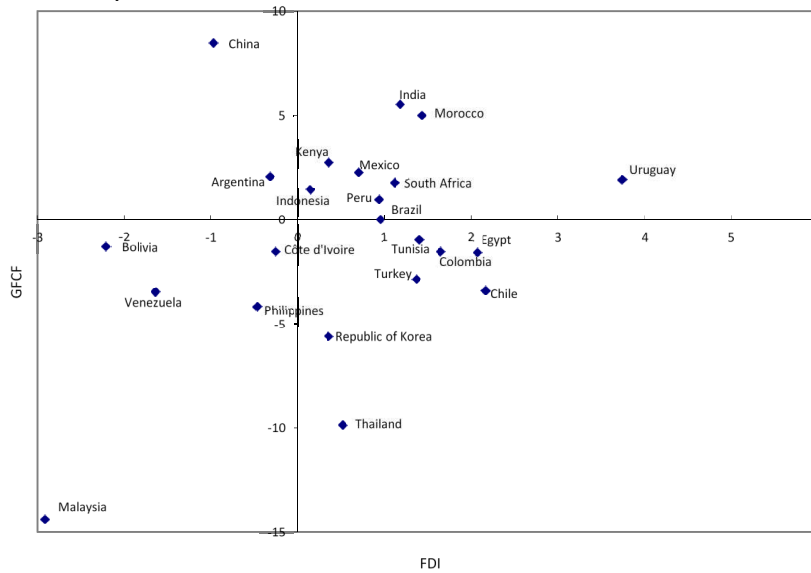
Source: UNCTADstat.

Chart 3. International Capital Inflow and Investment in EDEs[a]
(Per cent of GDP)
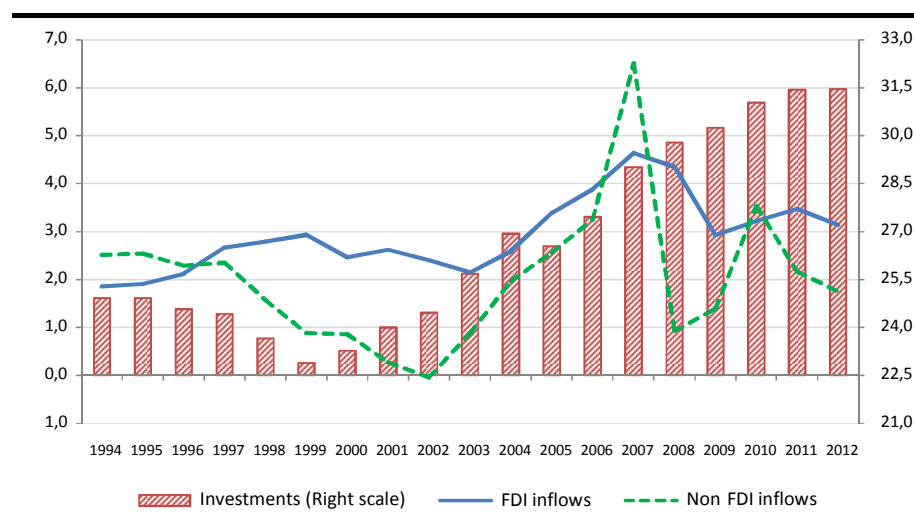
After the Asian crisis in 1997 until 2002, domestic investment and gross non-FDI capital inflows followed a downward trend while direct investment inflows kept up, due, in part, to the fire-sale FDI in crisis-hit countries noted above. After 2002, FDI and non-FDI inflows followed a similar path, rising quickly until the Lehman turmoil, plunging during 2008-09, and recovering subsequently but remaining below their pre-crisis levels.

Generally, FDI seems to follow, not lead, domestic investment. Evidence from a study of a large sample of countries over the 1984-2004 period indeed shows that lagged domestic investment has a powerful influence over FDI inflows to the host economy (Lautier and Moreau, 2012). On the other hand, FDI and non-FDI inflows are more closely connected than is commonly believed. This is partly because, like portfolio flows, part of FDI, property investment, is also driven by financial bubbles. Second, global liquidity conditions have a prime impact on FDI because assets acquired by TNCs are often leveraged. This is true not only for corporations from AEs but also from major EDEs (Akyüz, 2014). Financial cycles also exert a forceful push for profits of TNCs, which constitute an important source of FDI. As noted by the BIS (1998, p. 28), "short-term movements in FDI flows are highly pro-cyclical,

mainly reflecting the influence of reinvestment of retained earnings." These influences have been particularly evident in the new millennium, with FDI moving closely with non-FDI inflows. By contrast, several EDEs that had experienced bursts in both types of inflows went on to live through falling or stagnant domestic investment rates and deindustrialization (Akyüz 2012; Naudé *et al.*, 2013).

4. Impact on Stability

It is widely held that FDI constitutes a stable source of finance for balance-of-payments shortfalls. According to this view, because FDI is largely fixed in illiquid assets and reflects "lasting interest" by the investor, the likelihood of direct investment to exit rapidly at times of deterioration in global liquidity conditions and fading risk appetite is much lower than with other forms of capital inflows. In other words, "it is bolted down and cannot leave so easily at the first sign of trouble." (Hausmann and Fernández-Arias 2000, p. 3) Consequently, it is argued, they do not pose a serious threat to macroeconomic and financial stability in EDEs.

This account is misleading in that it ignores certain features of FDI and TNCs that can induce as much instability in the balance-of-payments and domestic asset and credit markets as portfolio investment and investors. Furthermore, many of the changes in financial markets that have facilitated international capital movements have not only accelerated the mobility of FDI, but also made it difficult to assess its stability.

First, recorded FDI statistics do not always enable the identifying of the stability of its various components and hence the destabilizing impulses they may generate. While FDI inflows do not always involve inflows of financial capital, their exit always implies outflows of funds through the foreign-exchange market. By convention, retained earnings are recorded as additions to equity capital, but in reality they may well be used to acquire financial assets or repatriated as portfolio outflows. Furthermore, financial transactions can accomplish a reversal of FDI. A foreign affiliate can borrow in the host country to lend the money back to the parent company or the parent can recall intercompany debt (Loungani and Razin, 2001). More generally, what may get recorded as portfolio outflows may well be outflows of FDI in disguise:

> Because direct investors hold factories and other assets that are impossible to move, it is sometimes assumed that a direct investment inflow is more stable than other forms of capital flows. This need not be the case. While a direct investor usually has some immovable assets, there is no reason in principle why these cannot by fully offset by domestic liabilities. Clearly, a direct in-

vestor can borrow in order to export capital, and thereby generate rapid capital outflows (Claessen *et al*. 1993, p. 22).

Second, FDI inflows can undergo temporary surges as a result of discovery of large reserves of oil and minerals, widespread privatization, rapid liberalization or favourable political changes. A glut in the foreign-exchange market resulting from a one-off bump in FDI inflows could generate unsustainable currency appreciations in much the same way as booms in any other forms of capital inflows, unlike the endemic fallacy that it is only short-term capital inflows that can lead to such an outcome. The impact on the currency could be particularly strong when FDI inflows involve acquisition of existing assets rather than greenfield investment since the latter involves imports of capital goods required to install production capacity.

Third, FDI includes components such as real-estate investment that are often driven by speculative motivations and susceptible to sharp fluctuations. This has led the IMF (2009, p. 105) to suggest that "[b]ecause it may have different motivations and economic impact from other direct investment, if real-estate investment is significant, compilers may wish to publish data on such investment separately on a supplementary basis." Cross-border property acquisitions have no doubt been central to the higher volatility and gyration of property prices in the past two decades in several countries. Historical data on housing transactions in London show considerable foreign effect on house prices and volume of transactions (Badarinza and Ramadorai, 2014). The recent recovery in house prices in London is predominantly due to growth in foreign demand (Property Wire, 2014b). Foreign purchases propelled the build-up of the Spain property bubble in the run-up to the crisis in 2008. Hopes are now pinned once again on foreign demand for the recovery of the housing market in Spain as sales to foreigners skyrocketed by almost 209% in the 12 months ending in October 2014, with the share of foreigners hitting a new high of 13% of the market (Taylor Wimpey, 2014). In Turkey, too, foreign buyers have been a main driver of the ongoing bubble in the property market (Property Wire, 2014a).

Fourth, the "lasting interest" the foreign direct investors are said to have with the direct investment enterprise does not always translate into a long-term commitment of that enterprise to the host country. Investment in bricks and mortar can be highly footloose, particularly in fragmented production segments organized by TNCs as part of international production networks for manufactured products. It is less likely to happen when investment is resource seeking, but even then the discovery of more profitable reserves elsewhere could lead to migration of FDI. The emergence of lower-cost countries for manufacturing production for global markets by TNCs can result in relocation

of production, particularly when host-country policies fail to lock TNCs into the economy with strong linkages to local firms and succeed in getting these companies to upgrade and move to higher echelons in the production chains they control." This is seen in East Asia, notably in Malaysia, where a number of plants producing electronics left for China as the latter emerged as a more attractive location for production for international markets (Ernst, 2004). Elsewhere, certain TNCs in electronics left Mexican maquiladoras for China and a number of other Asian countries, and Chinese inward FDI is found to have had a negative impact on FDI inflows to Mexico and Colombia, particularly after China joined the WTO (Zarsky and Gallagher, 2008; García-Herrero and Santabárbara, 2007). Much of the FDI in Ireland also appears to be hot money, encouraged by its entry to the EU and special incentives (Campa and Cull, 2013).

Finally, and perhaps more crucially, foreign banks established in EDEs can represent a looming source of financial instability. There is now a heavy presence of such banks in EDEs. Their share in banking in these economies doubled between 1995 and 2009 to reach 50% in the latter year, compared to 20% in OECD countries. A large majority of them are from AEs (Claessens and van Horen, 2012). These banks tend to skim the cream off of the banking sector in EDEs, picking the best creditors and depositors. They are better able to benefit from regulatory arbitrage by shifting operations back and forth between the home and host countries. More importantly, opposite to the long-held orthodox view that they enhance the resilience of EDEs to external financial shocks, it is now widely recognized that the extensive presence of foreign banks can aggravate EDEs' financial fragility and vulnerability to credit-market shocks. As pointed out in an IMF Staff Discussion Note, cross-border banking groups "are highly interconnected internationally and may expose individual countries to the risk that shocks in other countries will spill over into their domestic financial systems." (Fiechter *et al.*, 2011, p. 5)

These banks are known to have been instrumental in the rapid accumulation of external debt and balance-of-payments fragility in the Eurozone periphery in the prelude to the crisis. Also, during the recent rush of capital inflows into EDEs, they have been extensively engaged in carry-trade-like intermediations, benefiting from large interest-rate arbitrage margins between reserve-issuing AEs and EDEs and currency appreciations in the latter. They were also seen to act as a bringer of financial instability to AEs during the global crisis, transmitting credit crunches from home to host countries, cutting lending more than domestically-owned banks, and withdrawing earlier than domestic banks from the interbank market. They are generally slower than domestic banks in adjusting their lending to changes in host-country monetary

policy, thereby impairing its effectiveness. During the EZ crisis, foreign affiliates in many European emerging economies acted as conduits for capital outflows in support of their parent banks in the Eurozone core, leading to depletion of reserves and putting pressure on the currencies of host countries (Akyüz, 2014).

5. Impact on Balance-of-payments

5.1. Net Transfers

Most EDEs, particularly those with chronic current-account deficits and excessive dependence on foreign capital regard FDI more as a source of external financing than as an instrument of industrialization and development. In closing the external financing gap, FDI is preferred to debt-creating inflows because it does not entail fixed obligations and is considered more stable.

However, FDI can also result in considerable outflows in income remittances and hence exert pressure on the balance-of-payments in much the same way as debt obligations. A measure of this pressure is net transfers – that is, the difference between net inflows of FDI and FDI-related payments abroad, including profits, royalties, licence fees, wage remittances, and interest paid on loans from parent companies. This concept is akin to that of net transfers on debt obligations, discussed far and wide during the Latin American debt crisis. If income transfers abroad exceed net inflows of FDI in any particular year, then the gap would have to be closed either by generating a current-account surplus or by using reserves or borrowing abroad.[7]

At the early stages of involvement of EDEs with TNCs, the stock of FDI tends to be small relative to new inflows. But over time, inflows tend to fall relative to the stock. In other words, initially, the growth rate of the FDI stock is likely to exceed the rate of return on it, and net transfers on FDI would be positive. However, as the stock of FDI goes up, its growth rate tends to decline, eventually falling below the rate of return on existing FDI stocks, resulting in net negative transfers. Clearly, the higher the rate of return on foreign capital stock, the sooner the host country may face net negative transfers on FDI.

Countries with a long history of TNC involvement and thus a relatively large stock of foreign capital tend to suffer negative transfers. A developing economy with abundant labor and good infrastructure may start attracting hefty amounts of FDI for the production of labor-intensive manufactures for

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[7] This holds whether or not profits are remitted, since retained earnings are recorded as FDI inflows.

global markets, but over time FDI inflows are likely to level off as the surplus labor is exhausted, and wages start climbing. The emergence of low-cost locations can also lead to diversion of FDI, widening the gap between new inflows and income payments on foreign capital stock. Discovery of rich oil and mineral reserves can unleash a wave of FDI, but this cannot be maintained over time. In such countries, the growth rate of foreign capital stock can fall rapidly, and negative net transfers can appear in a relatively short time after the initial influx of foreign funds. Indeed, a sudden opening up of an economy could lead to a one-off boom in FDI inflows.

The long-term trend in the growth rate of FDI stock in EDEs is downward, albeit showing large swings and boom-bust cycles (Chart 4). This is clearly seen if periods of extreme instability are excluded. The average annual growth rate was around 14% during the first half of the 1990s, before the recurrent crises in EDEs. It fell to 11.3% during 2002-07 and again to less than 10% during 2010-13.

Chart 4. Inward FDI Investment in EDEs
             Ratio of FDI Flows to FDI Stocks *(Per cent)*
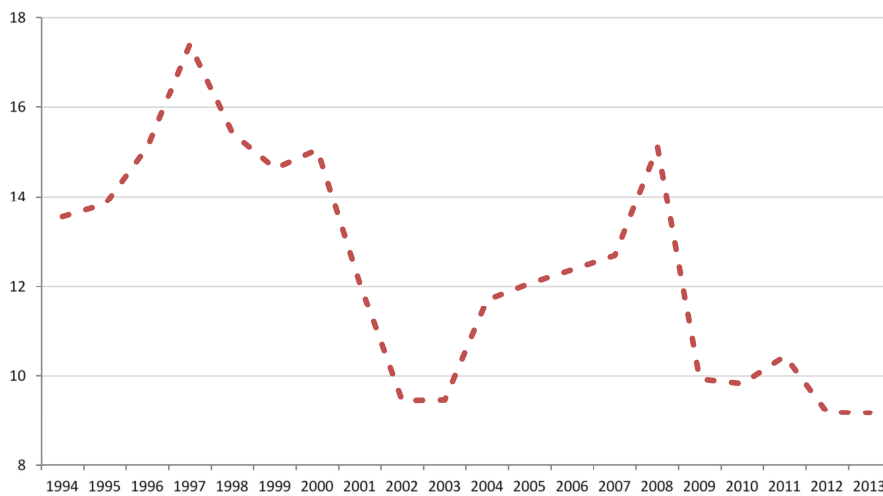
Source: UNCTADstats.

For EDEs as a whole, on average, annual inflows of FDI exceed income payments on FDI stocks. However, there are considerable inter-country variations.

Table 3. Net Transfers on FDI in Selected EDEs
Ratio of Cumulative Profit Payments to Cumulative FDI
Inflows: 2000-2013

Ranking	Country	Ratio		Country	Ratio		Country	Ratio
1	Algeria	3.09	10	Congo, Republic of	1.17	19	Colombia	0.83
2	Nigeria	2.09	11	Philippines	1.07	20	Zambia	0.73
3	Malaysia	1.73	12	Indonesia	1.06	21	China	0.52
4	Thailand	1.54	13	Chile	1.06	22	India	0.49
5	Singapore	1.43	14	Russian Federation	0.99	23	Brazil	0.43
6	Libya	1.38	15	Tunisia	0.95	24	Mexico	0.40
7	Cote d'Ivoire	1.31	16	Sudan	0.92	25	Kenya	0.39
8	Peru	1.21	17	Argentina	0.90	26	Egypt	0.39
9	South Africa	1.20	18	Korea	0.88	27	Turkey	0.18

Source: IMF BOP.
Note: For 2000-2004, data are based on BPM5, and, for 2005-2013, on BPM6.
Indonesia: 2003-2013; Peru: 2007-2013; Thailand: 2001-2012; Algeria: 2005-2013;
Congo: 2000-2007; Cote d'Ivoire: 2000-2010; Libya: 2000-2010; Singapore: estimates for 2002-12 based on national data; Sudan: 2002-2013.

This is shown in Table 3 in terms of a comparison of cumulative income payments on the stock of FDI with cumulative inflows over 2000-13 for a number of EDEs, including major recipients of FDI.In half of the countries in the table, total income payments exceeded total new inflows over that period. Two African oil exporters top the list in terms of negative net transfers.[8] They are followed by three Southeast Asian countries that relied extensively on FDI from the early stages of their development. By contrast, the ratio of profit remittances to new inflows is low in countries that received large inflows of FDI relative to the initial stock in the more recent period, including Brazil, China, and Turkey.

Of countries with negative net transfers, Malaysia has a long history of involvement with TNCs, often cited in the 1990s as an example of how to sustain rapid growth by attracting sizable inflows of export-oriented FDI. On both a per-capita basis and relative to GDP, it had one of the biggest FDI stocks and flows in the developing world in the 1990s (UNCTAD TDR, 1997, Table 32). However, the momentum could not be maintained, and the country saw its FDI plummet in the new millennium (Chart 2) on the back of the emergence of low-cost venues further afield and as a consequence of its failure to upgrade rapidly; at the same time, income transfers on FDI stock kept

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[8] According to Sumner *et al.* (2009, p. 3), in "sub-Saharan Africa, up to 90% of FDI inflows are lost in profit repatriation." However, since foreign firms in the primary sector are highly export-oriented, their current-account impact, discussed in the subsequent section, is still positive.

up with full force.[9] In Malaysia, manufactures no longer dominate export earnings, if measured in value-added terms, since they have much higher import content than commodities (Akyüz, 2012).

China, as a major recipient of FDI, still maintains a high level of FDI inflows as a proportion of its inward FDI stock, not only in comparison with Malaysia but also the rest of the developing world (Chart 5). However, such funds movements have been falling relative to the stock. This suggests that profit opportunities for foreign investors in labor-intensive sectors and processes for production for markets abroad are running out. To avoid a sharp drop in FDI inflows of the kind experienced by Malaysia, higher value-added sectors in China should become attractive to foreign investors, and this depends largely on its success in industrial upgrading.

Some countries with negative net transfers, such as Nigeria, Algeria, Malaysia, and Libya, have had relatively comfortable trade surpluses in recent years to help them meet negative net transfers on FDI. But these surpluses have been falling rapidly following the end of the commodity boom, resulting in deterioration in the current account. In Malaysia and Nigeria, the current-account surplus collapsed, falling from double-digit figures during 2006-08 to 2-3% in 2015. In Libya and Algeria, the impressive surpluses of earlier years have already disappeared, and these countries are now running yawning current-account deficits. Most of the others with negative net transfers in Table 3 also run deficits on trade in goods and services. This means that they need to rely on reserves or borrow abroad or attract highly volatile portfolio inflows in order to balance their external accounts. If reserves prove inadequate, and international lending and investment are cut back, they can then face liquidity problems due to the big income outflows on the stock of FDI.

In addition to officially recorded income transfers, TNCs are known to be extensively involved in illicit financial outflows from EDEs through such practices as tax evasion, trade mis-pricing, and transfer pricing.[10] Various estimates show that these account for the bulk of illicit outflows from EDEs. According to a recent report by a panel chaired by the former president of South Africa, Thambo Mbeki, the continent has been losing $50-60 billion per year in illicit financial outflows in recent years (UNECA, 2014).

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[9] Malaysia also ran negative net transfers in the late 1980s, but, in the 1990s, FDI inflows accelerated significantly, exceeding income payments on the stock – see Woodward (2001, Chapter 11).

[10] A factor contributing to tax avoidance is double-taxation agreements promoted by countries such as Switzerland, which often commit EDEs to low withholding tax rates (in order to create more favorable conditions for their investors) in exchange for greater help with tracking tax evaders; see Bonanomi and Meyer-Nandi (2013).

Chart 5. FDI Inflows and Stocks in China and Malaysia
Ratio of FDI Flows to FDI Stock *(Per cent)*
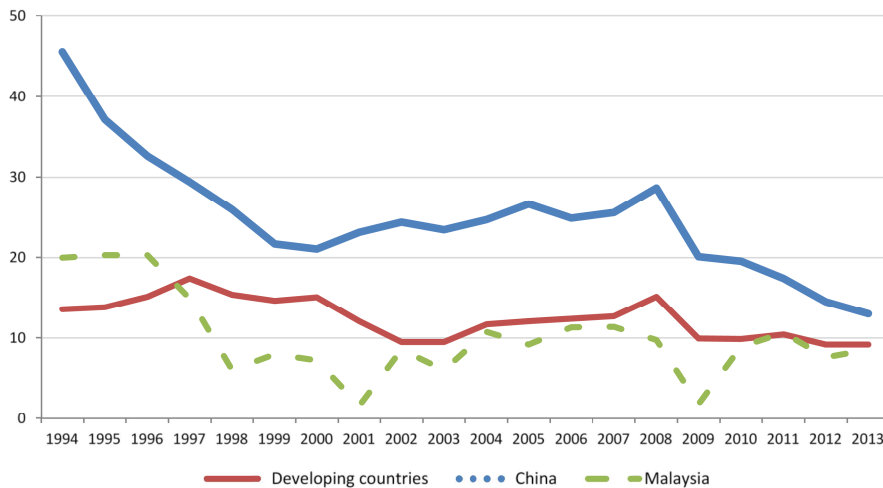
Source: UNCTADstats.

About 60% of this originates from the activities of large foreign companies that operate in Africa, mostly in sectors such as oil, precious metals and minerals, and ores. This is equal to three-quarters of the FDI that the continent receives annually. If this is added to recorded profit remittances by TNCs, then the region would go into the red in net transfers on FDI.

5.2. Trade and income transfers by TNCs

A broader measure of the impact of FDI on the balance-of-payments incorporates exports and imports of foreign-owned firms in addition to income transfers. The initial inflow of FDI for greenfield investment often entails imports of capital goods required to install production capacity, but these are financed by the inflow of FDI. In fact, since part of the goods and services needed to install production capacity would be procured locally, the overall payment impact would be positive.

The subsequent impact of foreign firms on the trade balance depends not only on their imports and exports, but also their effect on the imports and exports in the economy as a whole through supply-and-demand linkages and macroeconomic channels. A full account of the impact of FDI on imports would require identification of not only direct imports by the corporations concerned but also the indirect imports embodied in the goods and services

locally procured. Foreign entities may also generate import-substitution effects or can facilitate or impede exports by their local counterparts. However, most empirical studies on the balance-of-payments impact of FDI do not explicitly account for such indirect effects and spillovers.

The debate over the balance-of-payments impact of FDI has often focussed on the distinction between traded and non-traded sectors. FDI in non-traded sectors clearly leads to a net outflow of foreign exchange because it does not generate export earnings (or import substitution) but powers imports and profit remittances. Services are traditionally considered a non-tradable sector. However, the tradability of services has been expanding rapidly. In the past three decades, international trade in commercial services has grown faster than the trade in goods. They now account for a sizable proportion of the export earnings of some EDEs, such as India, where FDI is found to have greatly contributed to the breakout of services exports there (Saleena, 2013).

However, despite their increased tradability, much of the services sector is still non-traded. This implies that, *ceteris paribus*, a shift in the composition of FDI from primary and manufacturing sectors towards services could be expected to exacerbate its overall trade-balance impact. Indeed, such a shift had already started in the 1990s but accelerated in the new millennium. In the early 1990s, services had accounted for some 45% of total FDI inflows to EDEs, and this proportion averaged almost 60% during 2010-12 (Chart 6). During the same period, the share of manufacturing in total FDI inflows to EDEs fell from 36% to 27%, while the primary sector enjoyed a small gain, thanks to the commodity boom that started in the early years of the new millennium. If China is excluded, the increase in the share of services and the decline in manufacturing in FDI inflows to EDEs are much more pronounced.

On the other hand, the decline in the share of manufacturing in total FDI has been linked to a fundamental change in the nature of foreign investment in that sector. While earlier FDI flows into manufacturing were mainly motivated by attempts to overcome barriers to trade and involved establishing similar plants across countries, recently this horizontal production structure has been more and more replaced by a vertical structure designed "to slice up the value chain" through international production networks. This shift in the composition of FDI in manufacturing can be expected to improve its contribution to the balance of payments.

In discussing the impact of FDI on the current account, we should distinguish between inward-oriented and outward-oriented FDI, rather than traded and non-traded sectors. This applies to all sectors--primary, manufacturing, and services--though to different degrees. Inward-oriented foreign outfits sell

**Chart 6. FDI inflows to EDEs by Sector and Industry:
1990-1992 and 2010-2012** *(Per cent of total FDI inflows)*
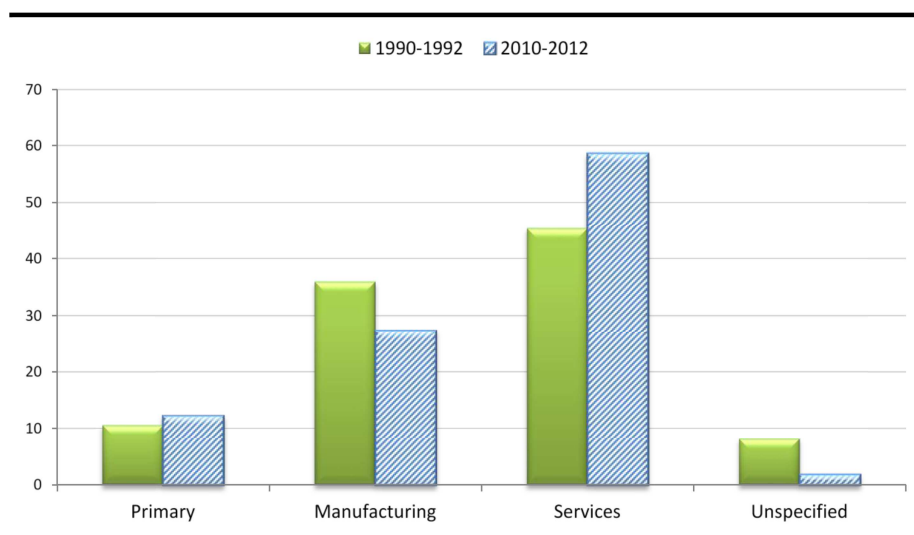
Source: UNCTAD *WIR* (2014).

mainly in the domestic market, while the principal outlets of outward-oriented TNCs are abroad. Foreign manufacturers established for tariff-jumping and market-seeking purposes fall into the former category and often account for more imports than exports. This is also true for most, though not all, foreign investment in services.

By contrast, foreign firms in natural resources, such as those in most parts of Africa, are generally outward oriented. Domestic sales constitute a tiny proportion of their total production, and they generate more exports than imports. Thus, their impact on the balance-of-payments tends to be positive. Operations connected to international production networks established and controlled by TNCs for supplying consumer manufactures to global markets are also outward oriented, but their domestic sales account for a greater proportion of total production than is typically the case for foreign firms active in primary sectors. Outward-oriented firms established in Export Processing Zones (EPZ) also sell a very large proportion of their production abroad.

Production by foreign businesses is generally more import intensive than that of local firms. There is also evidence that wholly foreign-owned companies are more import intensive than joint-venture establishments. On the other hand, in countries closely integrated into international production networks, such as China, Southeast Asian EDEs, and Mexico, the average import inten-

sity or foreign value-added content of exports is higher than those that are not so closely connected to such networks, such as Brazil and most other Latin American countries, South Africa, India, Russia, and Turkey (Koopman *et al.*, 2010; Koopman *et al.*, 2012; Akyüz, 2011b). In the former cases, an important part of the domestic value-added is absorbed by the profits of TNCs, which often enjoy tax concessions. This proportion is estimated to have been around three-quarters of value-added in the Chinese export sector (Akyüz, 2011a).

The impact of fully inward-oriented foreign firms to the current account is negative, while their contribution to GDP and GNI varies inversely with their imports and profits. Even when exports by these organizations meet their import bill, the impact on the current account would be negative because of profit remittances. To stop such firms from running current-account deficits, it would be necessary to raise their exports without commensurate increases in the import content of production.

The contribution of outward-oriented foreign corporations to GDP and GNI tends to be lower than that of inward-oriented firms because of their high import intensity. But their impact on the current account could be superior given their pronounced export orientation. This means that there may be no one-to-one correspondence between the export performance of TNCs and their contribution to domestic income. Indeed, some countries closely linked to international production networks in manufacturing are known to have widened their shares of world manufactured exports without commensurate increases in their shares in world value-added in manufacturing. This happened in Mexico in the 1990s. After NAFTA, Mexico's share in world manufactured exports moved up, while its ranking in world manufacturing value-added dropped. This happened because as high-export, low-value-added firms in maquiladoras expanded, the traditional industries with high value-added but low exports withered (UNCTAD TDR, 2002 and TDR, 2003).

Often, outward-oriented foreign firms established in EPZs have few supply-and-demand linkages with the economy other than through employment. They promise no significant dynamic benefits, and their contribution to the current account is mainly confined to wage payments, since such arrangements often include tax and tariff concessions. Their impact is quite similar to that of remittances from migrant workers abroad. However, since public investment would be required to establish a zone, the foreign-exchange surplus generated by these investors may not justify the costs incurred.

The main policy challenge for those EDEs that are part of the international production networks in manufactures is to get more of a contribution from

their foreign "partners" to the balance-of-payments, employment, and domestic value-added; their strategy, however, should be to reduce the import content of the foreigners' production, not increase their export orientation. This would mean import substitution; that is, moving up in the value chain and replacing imported high-value parts and components with domestic production.

The impact of FDI on the current account naturally depends on the type of investment as well as the policies affecting import content and the export orientation of foreign firms. That FDI would have a negative impact in countries where it is concentrated in areas with little or no export activity is incontrovertible. However, the discussions above suggest that this may also be the case even in countries with a strong presence of export-oriented foreign corporations, as a result of their high import intensity and profit remittances.

This appears to be what happened in several Southeast Asian EDEs closely connected to international production networks in manufacturing. Jansen (1995) simulated a model for Thailand for 1987-1991 to assess, *inter alia*, the impact of FDI on the balance-of-payments (see also UNCTAD WIR, 1997). It turned out that while FDI had fueled much of the expansion of exports it had also led to a hike in imports as well as royalty and license fees and profit remittances. About 90% of all machinery and equipment used for foreign investment projects and 50% of raw materials are estimated to have been imported. From the mid-1980s until 1991-92, exports as a percentage of GDP rose from 29% to 36%, while imports powered ahead from 25% to 40%. All of this swelled the current-account deficit more than the crest in FDI inflows and contributed to the build-up of external debt that culminated in the 1997 crisis.

A study of Malaysia also estimated that the impact of foreign direct investment on the current account, including the initial imports associated with FDI inflows, was negative in every year during 1980-1992, and this was offset by FDI inflows in only four years (Eng, 1998). According to another estimate, the FDI-related current account continued to be in the red also during 1993-96 (Woodward, 2001). Putting all these together, it appears that throughout the entire period 1980-1996, the impact of FDI on the current account in Malaysia was negative in every year, with new FDI inflows matching or exceeding these deficits in only five years.

There is also evidence from other countries with a large contingent of outward-oriented foreign players in the services and manufacturing sectors. India is one of them. As noted, FDI has been central to the successful performance of its services exports. Still, the overall impact of FDI on the Indian current

account appears to have been negative in the 1997-2011 period (Sarode, 2012). Another estimate comes from Indonesia, one of the top recipients of FDI inflows among EDEs (Dhanani and Hasnain, 2002). During 1990-96, FDI accounted for a quarter of manufacturing production in Indonesia. However, foreign companies imported 55% of raw materials and intermediate goods; this was more than double that of domestic producers. Overall, FDI actually hurt the balance of payments and contributed to the persistent deficits in manufacturing due to the foreigners' high propensity to import production inputs.

China's experience as a top recipient of export-oriented FDI reveals several interesting features and lessons for countries wanting to be a part of the international production networks, which have been established and are controlled by TNCs from AEs. It was estimated by UNCTAD (WIR, 1997, Chapter II) that the trade balance of foreign affiliates in China was negative throughout 1994-1996. Adding payments of direct investment income, this meant even a larger deficit in the current account. However, these were more than covered by new inflows of FDI as China had emerged as the number-one recipient of FDI in the developing world in the 1990s. The trade deficits of foreign firms reflected those in the non-processing trades since export-oriented operators in the processing trade generated growing surpluses as a result of declines in their import intensity. However, the import intensity of these firms was still higher than that of locals active in the processing trade – 78% compared to 66%.

More recent research, based on input-output data and accounting for indirect as well as direct import content, indicates that the average import intensity of Chinese exports has declined in the new millennium. In processing exports where foreign firms are dominant, China has been shifting from simple assembly of foreign parts and components towards operations with greater domestic inputs, thereby raising the domestic value-added content. According to an estimate, the share of foreign value-added in China's processing exports tumbled from 79% in 1997 to 62.7% in 2007, and in its total manufactured exports from 50% to 40% (Koopman *et al.*, 2012).

This resulted in a huge improvement in the trade balance of foreign affiliates in China in the new millennium. Indeed, exports by foreign-funded corporations, including wholly foreign-owned and joint-venture institutions, constantly exceeded imports after 2000 (Table 4). Income payments on direct investment also rose rapidly, but the trade surplus generated by foreign firms was large enough to finance these until 2010. Since that year, the current-account balance of foreign affiliates in China turned negative, with income

payments exceeding the portion of the trade surplus generated by them. This implies that, unless the import intensity of foreign affiliates is slashed, China

Table 4. Foreign-funded Enterprises in China
(Billions of US dollars)

	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013
1. Imports	117.3	387.5	472.5	559.8	619.4	545.4	738.4	864.7	871.5	874.6
2. Exports	119.4	444.2	563.8	695.4	790.5	672.1	862.2	995.2	1022.6	1043.7
3. Trade balance	2.2	56.7	91.3	135.6	171.1	126.7	123.8	130.6	151.1	169.1
4. FDI Income payments	20.2	47.6	49.5	61.9	72.6	105.9	159.6	204.5	171.8	206.4
5. Current-account impact	-18.0	9.1	41.8	73.7	98.4	20.7	-35.8	-73.9	-20.7	-37.2
6. FDI inflows	38.4	111.2	133.3	169.4	186.8	167.1	273.0	331.6	295.6	347.8

Source: National Bureau of Statistics of China and IMF *Balance of Payments Statistics database*.

could face growing current-account deficits caused by them as income payments on the stock of FDI mount.[11]

As in the 1990s, FDI inflows have been strong enough to meet the foreign-exchange shortfalls generated by foreign affiliates in China in recent years. However, closing the gap with more and more FDI inflows would be very much like Ponzi financing, whereby existing liabilities are met by incurring new liabilities. It is true that currently China does not need new FDI inflows to pay for the existing ones. Despite growing income payments on FDI stock, China has been running a current-account surplus, thanks to the strong export performance of its local firms. However, although it has a positive net international asset position (Akyüz, 2014), it has been in the red in investment income – since 2000, income paid by China on all foreign liabilities, including debt and equities, has exceeded the income received on all foreign assets held—in every year except 2007-08. Its outward FDI stock has reached almost two-thirds of its inward FDI stock, but income generated by FDI assets has been less than 15% of the income paid on FDI liabilities.

It is not clear if China can keep running surpluses on its current account. Its surplus has already declined, from a peak of 10% of GDP in 2007 to less than 2% in 2013-14. There is wide agreement that China needs to up its share of private consumption in GDP in order to sustain an acceptable pace of growth. If consumption starts rising faster than other components of aggregate

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[11]   An earlier study of the dynamic effect of FDI on the balance-of-payments in China concluded that as more companies come in, China's current account could turn from a surplus to a deficit; see Yao and Fan (2004).

demand, its trade surplus can shrink rapidly and may even fall below the amount equal to net investment income payments abroad, thereby leading to a deficit on the current account. Thus, a viable strategy for China would be to continue to reduce the import intensity of its exports, primarily by foreign affiliates.

Recent evidence suggests that import substitution in China's export industries has been continuing with full force since the crisis, and this is a main factor in the slowdown in global trade. For the first time in over four decades, international trade grew more slowly than world income during 2012-13. It is argued that this cannot be explained by cyclical factors alone, such as the Eurozone crisis. The link between trade and income growth is seen to have been undergoing a structural change since the crisis, with income growth generating slower expansion of trade than in the past. According to this analysis, the changing relationship between world trade and income "is driven primarily by changes in supply-chain trade in the two largest trading economies, the United States and China … [and] is reflected in a fall in the share of Chinese imports of parts and components in total exports, which decreased from its peak of 60% in the mid-1990s to the current share of about 35%" (Constantinescu *et al.*, 2014, pp. 40-41). Thus, in China, a larger proportion of effective demand, both domestic and foreign, is now met by domestic production rather than imports as many activities that previously involved cross-border movement of goods are now taking place within national borders.

There can be little doubt that FDI should not be judged on the basis of its balance-of-payments impact alone. It may yield other benefits even when it has a negative contribution to the current account, such as easier access to markets abroad and positive spillovers to the rest of the economy. However, these benefits should be carefully weighed against the costs inflicted by the deficits of the foreign investors. These costs can be quite onerous in a forex-constrained economy. Deficits run by the foreign corporate community can reduce the volume of imports of capital and intermediate goods needed to operate and add to existing productive capacity, thereby depressing economic activity and lowering aggregate employment, even if these firms themselves employ a relatively large number of local workers. To avoid these outcomes, the country would need to borrow internationally in order to meet the current-account deficits generated by the foreign firms.

If the impact of FDI on the current account is negative, and foreign firms bring no significant spillovers and externalities, it might be preferable to borrow the money and make the investment domestically rather than rely on FDI. This is because the rate of return on FDI is much higher than borrowing costs, estimated at close to 20% for a sample of EDEs over 1995-98 (Lehmann,

2002). It is true that income payments on FDI depend on the profitability of enterprises and, unlike debt, no payment would be involved unless profits are generated. But this also means that the host country would be writing a "blank check" (Woodward, 2001, p. 144), which could eventually entail significant transfers of resources. Thus, it might be cheaper to make the same investment with borrowed money.

6. Spillovers, Growth, and Structural Change

TNCs from more advanced economies enjoy certain capabilities and own firm-specific tangible and intangible assets that distinguish them from their competitors. They take these assets to the EDEs in which they invest, but they would be reluctant to pass their competencies onto local enterprises since that would reduce the rent they can earn. Furthermore, the competitive advantage they have can also damage local industry. Deliberately and carefully designed policies are needed both to prevent potential adverse effects of TNCs on the host economy and to promote positive spillovers. For this, it is important to correctly identify the capabilities of foreign companies, the channels through which they could stimulate growth and structural change, and the policies needed to deploy them.

There is a vast literature on the capabilities and competencies of TNCs from more advanced countries and the nature, channels, and effects of spillovers to the local economy in host countries (Kumar, 2002; Malik *et al.,* 2012; Forte and Moura, 2013; Danakol *et al.,* 2014). In this context, FDI is seen not so much as a flow of capital but as one of advanced technology and management skills – the two key determinants of their superior productivity. In addition, these firms also enjoy better access to global markets because of their close linkages. Exporting and international procurement are easier and less costly to them than to local corporations. They often have the advantage of a brand image, and this helps them not only in marketing goods and services but also in attracting the best talents. They also have easier access to international financial markets and better credit ratings, and this gives them a significant cost advantage.

The main channels through which technological spillovers from TNCs to the economies of host countries occur include competition, imitation, demonstration, and labor turnover. However, the impact is not always benign. The high productivity and competition they bring could help improve the efficiency of local businesses, but these can also block entry of the latter into high-value production lines or drive them out of business. They can prevent rather than promote infant-industry learning unless the locals are supported and protected by tailor made policies. Local firms can learn and imitate more easily when their foreign competitors establish forward and backward linkages with

them instead of relying on linkages abroad. Domestic linkages are also essential for the integration of local firms into the global market. Foreign affiliates can have a notable impact on industrial structure if they invest in relatively technology-intensive industries and relocate some of their R&D activities to host countries, but this may not be the most profitable option for them. Again, they can help improve the skill profile and the level of technical knowledge in the host country by employing and training local workers--but not so much if they focus on labor-intensive sectors or import labor along with capital.

For all these reasons, there can be no generalization regarding the impact of FDI on capital formation, technological progress, economic growth, and structural change. Indeed, there is no conclusive evidence to support the myth that FDI makes a major contribution to growth. This is emphatically put by Caves (1996, p. 237): "The relationship between an LDC's stock of foreign investment and its subsequent economic growth is a matter on which we totally lack trustworthy conclusions." What is established by most studies is that the effect of FDI depends on a host of other variables that are endogenous to the growth process. Positive spillovers from foreign companies can become marked only when there is already in place an appropriate level of local capabilities. Even then, policy in host countries is central to generating the conditions needed to secure positive spillovers.

There is considerable diversity in the extent to which EDEs have been relying on FDI for industrialization and development. Successful examples are found not necessarily among EDEs that attracted more FDI, but among those that exploited it for purposes of national industrial policy that was itself designed to shape the evolution of specific industries with the goal of accelerating industrialization and growth. In fact, the wide-ranging presence of foreign corporations could well be a sign of weakness of indigenous capabilities.

Both cross-country and case studies show that, in several instances, performance requirements imposed on FDI made a positive contribution to various development objectives without discouraging the FDI received.[12] East Asian EDEs have generally been more successful in attracting and using FDI for industrialization than countries at similar levels of development elsewhere. However, there is much diversity among them in the extent to which they have relied on FDI as well as in the policies pursued (UNCTAD TDR, 1994 and 1996).

Among the first-tier newly industrializing economies (NIEs), Korea and Taiwan relied on FDI much less than Singapore and Hong Kong—or, for that

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[12] On the theoretical issues involved and empirical evidence, see a number of essays in Kozul-Wright and Rothorn (1998), Kumar (2005), and Rasiah (2005).

matter, the second-tier NIEs, notably China, Malaysia, and Thailand. As in Japan, they focussed on promoting indigenous enterprises and local technological capabilities, using FDI only in targeted industries alongside other forms of technology transfer, such as reverse engineering, import of capital goods, and technology licensing. They also used original equipment manufacturers (OEM) to induce foreign investors to supply technological information and integrate local enterprises into international markets. Strong support was provided to R&D to help adapt and improve imported technology.

FDI regimes in Korea and Taiwan were restrictive and selective, and domestic policies were highly interventionist, particularly during the catching-up period. Licensing agreements were tightly controlled, and imported technologies were closely screened to promote domestic learning. Local firms were nurtured to compete with TNCs and reduce dependence on them, particularly in Korea. Foreign ownership was restricted in certain sectors, and joint ventures rather than wholly foreign-owned enterprises were promoted. Local-content agreements were set up in many locales, not only for balance-of-payments reasons, but also to foster linkages with domestic suppliers and hence facilitate diffusion of technology and management skills. Managerial and technical assistance and training of engineers and technicians were part of the contracts with foreign companies, especially those from Japan.

Although both Hong Kong and Singapore relied heavily on FDI, there were important differences in the policies pursued and therefore the contribution of FDI to industrialization. While Hong Kong followed a laissez-faire policy towards FDI, Singapore targeted specific industries for support, offering incentives and imposing restrictions. In Hong Kong, FDI helped to establish a low-skill industrial base, but brought little upgrading. Its lack of industrial depth and massive deindustrialization thus stand in sharp contrast to the rapid upgrading and industrial success of Singapore.

Among the second tier-NIEs, Malaysia and Thailand have followed a liberal approach towards FDI, allowing fully-owned foreign subsidiaries. However, after initial success in establishing assembly industries, they have not been able to develop a diversified manufacturing base and reduce their dependence on imported capital and intermediate goods. By contrast, China's FDI regime has been more restrictive, with highly interventionist policies. It started like Malaysia and Thailand, combining low-skilled assembly activities with high-technology imported parts, but it then moved more vigorously in upgrading and reducing the foreign value-added in its production and exports,

as noted above.[13] However, while it has moved faster than all late-industrializers over the past three decades, including the first-tier NIEs, it still has a long way to go to catch up with the productivity levels and industrial sophistication of indigenous companies, not only in Japan but also in Korea (Zhu, 2012).

7. Multilateral and Bilateral Constraints on Investment Policy

The experience strongly suggests that policy interventions would be necessary to contain the adverse effects of FDI on stability, the balance of payments, capital accumulation, and industrial development and to activate its potential benefits. However, policy options in EDEs have been increasingly circumscribed in the past three decades as international capital and TNCs have gained more and more space to maneuver. There are two main sources of constraints on national policy in this area: multilateral rules and obligations in the WTO regarding investment policies, and commitments undertaken in investment and trade agreements signed with home countries of investors in EDEs. Although there is considerable diversity in the obligations contained in various BITs, the constraints they entail are becoming increasingly tighter than those imposed by the WTO regime.

There are two main sources of WTO disciplines on investment-related policies: the Agreement on TRIMs and specific commitments made in the context of GATS negotiations for the commercial presence of foreign enterprises (the so-called mode 3) in the services sectors. In addition to these, a number of other agreements provide for limits, directly or indirectly, on investment-related policies, such as the prohibition of investment subsidies linked to export performance in the Agreement on Subsidies and Countervailing Measures.

The TRIMs agreement does not refer to foreign investment as such but to investment generally.[14] It effectively prohibits attaching conditions to investment in violation of the national treatment principle or quantitative restrictions in the context of investment measures. The most important provisions relate to the prohibition of (1) domestic-content requirements, whereby an investor is compelled or provided an incentive to use domestically produced rather than imported products; and (2) foreign-trade- or foreign-exchange-balancing requirements linking imports by an investor to its export earnings or to the for-

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[13] Exports of Southeast Asian NIEs, including Malaysia, Thailand, and Vietnam, have higher import content than exports of China; see Akyüz (2011a).

[14] This is provided by a subsequent interpretation by a panel on a TRIMs dispute; for a detailed discussion, see Das (1999, chap. 3.6) and Bora (2002).

eign-exchange inflows attributable to investment. By contrast, in TRIMs or the WTO more broadly, there are no rules restricting beggar-thy-neighbor investment incentives offered by recipient countries that are equally trade distorting. Such incentives provide an effective subsidy to foreign investors and can influence investment and trade flows as much as domestic-content requirements or export subsidies, particularly since a growing proportion of world trade is taking place among firms thrown together via international production networks that are controlled by TNCs (Kumar, 2002).

The obligations under TRIMs may not greatly affect the countries rich in natural resources, notably minerals, in their earlier stages of development. FDI in mineral resources is generally capital intensive, and countries at such stages depend almost fully on foreign technology and know-how in extractive industries; they also lack capital-goods industries. Linkages with domestic industries are usually weak, and output is almost fully exported. The domestic content of production by foreign companies is mainly limited to labor and some intermediate inputs. The main challenge is how to push local processing so as to increase domestic value-added. However, over time, restrictions on domestic-content requirements can reinforce the "resource-curse syndrome," as the country wants to undergird resource-based industries, to transfer technology to local firms, and to establish backward and forward linkages with them.

Restrictions on domestic-content requirements are particularly a concern for investors in manufacturing in countries at intermediate stages of industrialization, especially in the automotive and electronics industries – the two key sectors where they were successfully applied in East Asia. As noted, most industries in EDEs that are part of international production networks have high import content in technology-intensive parts and components, while their domestic value-added mainly consists of wages paid to local workers. Raising domestic content would not only improve the balance-of-payments but also constitute a pivotal step in industrial upgrading. Restrictions on domestic-content requirements would thus limit transfer of technology and import substitution in industries that are connected to international production networks.

However, TRIMs' provisions leave certain flexibilities that could give EDEs the room to move in order to multiply the benefits from FDI. First, the domestic content of industrial production by TNCs is not independent of the tariff regime. Other things being equal, low tariffs and high duty drawbacks encourage high import content. Thus, it should be possible to use tariffs as a substitute for quantity limits on imports by TNCs when they are unbound in the WTO or bound at sufficiently high levels. Similarly, in resource rich countries, export taxes can be wielded to discourage exports of unprocessed miner-

als and agricultural commodities as long as they continue to remain unrestricted by the WTO regime.

Second, as long as there are no commitments for unrestricted market access to foreign investors, the constraints prescribed by the TRIMs agreement could be overcome by tying the entry of foreign investors to the production of particular goods. For instance, a foreign enterprise may be issued a license for an automotive assembly plant only if it simultaneously establishes a plant to produce the engines, gearboxes, or electronic components for the cars. Similarly, licenses for a computer assembly plant could be made conditional on the establishment of a facility for manufacturing integrated circuits and chips. Such measures would raise the domestic value-added and net export earnings of TNCs and not contravene the provisions of the TRIMs agreement.

Third, there might be export-performance requirements without reference to imports by investors as part of entry conditions for foreign enterprises. This would not contravene the TRIMs agreement since it would not be restricting trade (Bora, 2002, p. 177). Finally, the TRIMs regime does not prevent governments from demanding joint ventures with local enterprises or local ownership of a certain proportion of the equity of foreign enterprises. In reality, many of these conditions appear to be resorted to by industrial countries in one form or another (Weiss, 2005).

Since the TRIMs agreement applies only to trade in goods, local procurement of services, such as banking, insurance, and transport, can also be set as part of entry conditions for foreign companies in order to help develop national capabilities in the services sectors. However, this would be possible only as long as EDEs continue to have discretion in regulating access of TNCs to services sectors. The existing GATS regime provides considerable flexibility in this respect, including for performance requirements. However, the kind of changes in the modalities of GATS sought by AEs, including the prohibition of pre-establishment conditions and the application of national treatment, could shrink EDEs' latitude in policymaking a lot more than the TRIMs agreement.[15]

The constraints exerted by most BITs signed in recent years on policy options in host countries go well beyond the TRIMs agreement when one examines the wide-ranging provisions in favor of investors. These include broad definitions of investment and investor, the free transfer of capital, rights to establishment, the national treatment and the most-favored-nation (MFN)

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[15] Cho and Dubash (2005) discuss the implication of adopting national treatment in GATs in relation to the electricity sector, while Rasiah (2005) provides an illustrative account of policymaking in Malaysia.

clauses, fair and equitable treatment, protection from direct and indirect expropriation, and prohibition of performance requirements (Bernasconi-Osterwalder *et al*., 2012). Furthermore, the reach of BITs has been extended, thanks to the use of the so-called SPEs.[16] Many BITs also provide unrestricted arbitration, freeing foreign investors from the obligation of having to exhaust local legal remedies in disputes with host countries before seeking international arbitration. This, together with a lack of clarity in treaty provisions, has resulted in the emergence of arbitral tribunals as lawmakers in international investment. These tend to provide expansive interpretations of investment provisions, thereby constraining policy further and inflicting costs on host countries (Bernasconi-Osterwalder *et al*., 2012; Eberhardt and Olivet, 2012; UNCTAD TDR, 2014).

While in TRIMs investment is a production-based concept, BITs generally incorporate an asset-based concept of investment, whether the assets owned by the investor are deployed for the production of goods and services, or simply held with the prospect of income and/or capital gain. This is largely because BITs are fashioned by corporate perspectives even though they are signed among governments. Typically, agreements are prepared by the home countries of TNCs and offered to EDEs for signature. They include a broad range of tangible and intangible assets, such as fixed-income claims, portfolio equities, financial derivatives, intellectual property rights, and business concessions, as well as FDI as officially defined by the OECD and the IMF. This implies that all kinds of assets owned by foreigners could claim the same protection and guarantees independent of their nature and contribution to stability and growth in host countries.

It also opens the door to mission creep. Investment agreements may be granted jurisdictions by tribunals over a variety of areas that have nothing to do with FDI proper, further circumscribing the policy options of host countries. Indeed, the expansive scope of investment protection in NAFTA has already given rise to claims that patents are a form of investment and, on that basis, should be protected as any other capital asset, thereby threatening the flexibilities left in the TRIPs Agreement and access to medicines (Correa, 2013). Similarly, there have been claims by Argentinian bond holders that such holdings should be protected as any other investment under the Italy-

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[16] For example, if country A has no BIT with country B, and a TNC from A wants to invest in country B, it can create an affiliate in country C with a BIT with country B and make the investment through that affiliate in order to benefit from the BIT between B and C. This creates "transit FDI" and leads to double-counting in reported FDI figures – see UNCTAD WIR (2014, Box I.1).

Argentina BIT, representing an intervening in the restructuring of sovereign debt (Gallagher, 2012).

The combination of a broad asset-based concept of investment and provisions for free transfer of capital seriously exposes host EDEs to financial instability by precluding controls over destabilizing capital flows. This is also recognized by the IMF. In its Institutional View on the Liberalization and Management of Capital Flows, the IMF (2012) notes that "numerous bilateral and regional trade agreements and investment treaties … include provisions that give rise to obligations on capital flows" (para. 8) and "do not take into account macroeconomic and financial stability" (para. 65) and "do not allow for the introduction of restrictions on capital outflows in the event of a balance-of-payments crisis and also effectively limit the ability of signatories to impose controls on inflows" (Note 1, Annex III). The Fund points out that these provisions may conflict with its recommendation on the use of capital controls and asks its Institutional View to be taken into account in drafting such agreements.

Although the IMF's Institutional View focuses mainly on regulating capital inflows to prevent build-up of financial fragility, prohibitions in BITs regarding restrictions over outflows can also become a major handicap in crisis management. It is now widely agreed that countries facing an external financial crisis due to an interruption of their access to international capital markets, a sudden stop of capital inflows, or rapid depletion of reserves could need temporary debt standstills and exchange controls in order to prevent a financial meltdown (Akyüz, 2014). However, such measures might be deemed illegal under the "free transfer of capital" provisions of BITs.

Where rights of establishment are granted, the flexibilities in the TRIMs regarding the entry requirements noted above would simply disappear. The national-treatment clause in BITs requires host countries to treat foreign investors no less favorably than its own national investors and, in so doing, prevents them from protecting and supporting infant industries against mature TNCs and bolstering domestic firms to compete with foreign affiliates. It brings greater restrictions than national treatment in TRIMs because it would apply not to goods traded by investors but to the investor and the investment.

Furthermore, provisions on expropriation and fair and equitable treatment give considerable leverage to foreign affiliates in challenging changes in tax and regulatory standards and demanding compensation. Especially, the concept of indirect expropriation has led states to worry about their ability to regulate. The fair and equitable treatment obligation has also been interpreted

expansively by some tribunals to include the right of investors to a stable and predictable business environment.

The large majority of outstanding BITs do not make any reference to performance requirements of the kind discussed above, but a growing number of those signed in recent years incorporate explicit no-go areas (Nikièma, 2014). Some BITs go beyond TRIMs and bring additional bans on performance requirements, both at pre- and post-establishment phases. Others simply refer to TRIMs without additional restrictions. Still, this narrows the ability of governments to move within the WTO regime, as it allows investors to challenge the TRIMs-compatibility of host-country actions outside the WTO system. This ups the risk of disputes that host countries can face since corporations are much more inclined to resort to investor-state arbitration than the states do in the WTO system. The MFN clause could entail even greater loss of policy autonomy in all these areas, including performance requirements, by allowing foreign investors to invoke the more favorable rights and protection granted to foreign investors in agreements with third-party countries.[17]

While investment agreements entail a considerable loss of policy autonomy, they do not appear to be serving the intended purpose and accelerating the kind of FDI inflows sought by the policymakers in host countries. Evidence suggests that BITs are neither necessary nor sufficient to bring in significant amounts of FDI. Most EDEs are now wide open to TNCs from AEs through unilateral liberalization or BITs or Free Trade Agreements (FTAs), but only a few are getting FDI with significant developmental benefits, and most of these countries have no BITs with major AEs. Econometric studies of the impact of BITs on FDI flows are highly ambivalent. While a few of them contend that BITs affect FDI flows, they do not examine whether BITs have led to the kind of FDI inflows that add to industrial dynamism in host countries. The majority of empirical studies find no link between the two (UNCTAD, 2009b, Annex and UNCTAD TDR, 2014, Annex to Chapter VI). Similarly, survey data show that the assessors of political risk or in-house counsel in large US corporations do not pay much attention to BITs when weighing in on investment decisions (Yackee, 2010).

8. Conclusions

Unlike the philosophy inherent in the dominant corporate ideology, FDI is not a recipe for the rapid and sustained growth and industrialization of EDEs. A hands-off approach to FDI, as to any other form of capital, can lead to more

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[17] For a more detailed account of various provisions of BITs, their interpretation by tribunals, and their impact on policymaking, see Bernasconi-Osterwalder *et al.* (2012).

harm than good. FDI policy needs to be embedded in the overall industrial strategy in order to ensure that it contributes positively to the economic dynamism of EDEs. The discussions above suggest several policy lessons:

- Encourage greenfield investment but be selective in terms of sectors and technology;

- Encourage joint ventures rather than wholly foreign-owned affiliates in order to accelerate learning and limit foreign control;

- Allow M & A only if there are clear benefits to be gained in terms of managerial skills and follow-up investments;

- Do not use FDI as a way of meeting balance-of-payments shortfalls. The long-term impact of FDI on external payments is often negative, even in EDEs attracting export-oriented firms;

- Debt financing may be preferable to equity financing when there are no measurable positive spillovers from FDI;

- FDI contains speculative components and generates destabilizing impulses that need to be controlled and managed, like any other form of international capital flows;

- No incentives should be provided to FDI without securing reciprocity in benefits for industrialization and development;

- Performance requirements may be needed to secure positive spillovers, including the employment and training of local labor, local procurement, domestic content, export targets, and relationships with local firms;

- Domestic firms should be nurtured to compete with TNCs;

- Linking to international production networks organized by TNCS is not a recipe for industrialization. It could trap the economy in the lower ends of the value chain.

The ability to establish policy guidelines in all these areas might be somewhat constrained by the WTO agreement on TRIMs, but it is still possible for EDEs to encourage positive spillovers without violating the WTO commitments. However, many of the more serious constraints are, in practice, self-inflicted through investment and free-trade agreements. There are salient reasons for EDEs to avoid negotiating the kind of BITs promoted by AEs. They need to turn their attention to improving their underlying economic fundamentals rather than pinning their hopes on BITs to attract FDI. Where commitments undertaken in existing BITs seriously impair their ability to harness

FDI for industrialization and development, they should be renegotiated or terminated, as is being done by a number of EDEs, even if doing so may carry some immediate costs in its wake.

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THE EMPLOYMENT EFFECT OF THE MINIMUM WAGE: AN EMPIRICAL ANALYSIS FROM TURKEY[*]

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   This paper examines the relationship between the minimum wage and employment in Turkey for the years 2004 -14. We investigate whether the national minimum wage has affected the employment rates of workers aged 15-29 by taking regional disparities into account. Our results do not suggest any dis-employment effect of the minimum wage. However, a correlation between the minimum wage and the informal employment rate is confirmed.

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1. Introduction

The impact of the minimum wage on employment is a controversial topic within the minimum-wage literature. Although a large body of theoretical and empirical work has been devoted to detecting any such effects, no consensus has emerged on this issue. Various theoretical models predict different outcomes, depending on their underlying market-structure assumptions. As for the empirical evidence, most of which is derived from developed countries, it suggests that the minimum wage causes slight disemployment (Neumark and Wascher, 2006). At the same time, there is a growing body of literature on the influence of the minimum wage over employment in developing countries. However, given certain typical features of these markets, such as low enforcement or informal employment, as pointed out by Lemos (2009), one has to view such empirical assessments as somewhat compromised (Lemos (2009).

Those who oppose minimum-wage legislation state that an enforced lower limit of wages that is fixed above the market-clearing level will lead to employment losses in a competitive labor market. Furthermore, in an era of intense economic globalization like the current one, labor-market regulations like the minimum wage and unemployment insurance should be revamped to allow for more labor-market flexibility (Heckman and Pages, 2000). On the other side, advocates of the minimum wage believe that working conditions are deteriorating in the wake of globalization and the accompanying intense competition, producing *a race to the bottom* (Carr and Chen, 2002). This being the case, a minimum wage is seen as a desirable redistributive tool to achieve social justice. This contentious debate has preoccupied labor economists since the last century. While the related literature at the beginning of the 20th century relied mainly on theoretical predictions, time-series evidence has dominated empirical studies since the 1950s.

In this paper, we aim to investigate the employment effects of the minimum wage in Turkey through the use of regional data. Specifically, we are seeking to establish whether Turkey's national minimum wage adversely affects employment, against the backdrop of the regional disparities in productivity. A national minimum-wage policy that mandates a payment floor is theoretically problematic in a context of regional heterogeneity. It might be argued that such a policy is desirable in order to drive regional convergence, thus helping disadvantaged citizens move out of poverty. However, a higher wage floor in regions with low productivity could hurt employment. Moreover, evaporating job opportunities in poor regions tend to provoke internal

migration[1]. We attempt to examine how the national minimum wage affects the employment level in Turkey, where the goal of regional economic convergence has not been achieved over the last decades (Gezici and Hewings, 2004). We mainly rely on the findings of Calavrezo and Pelek (2011), which indicate that women and the young are overrepresented among minimum-wage workers. Having taken the very low labor-participation rate of Turkish women into consideration, we prefer to focus on youth employment as the population of interest for this research[2].

Although a detailed review of the literature is beyond the scope of this paper, we provide a survey of empirical research that focuses on developing countries. These economies are generally characterized by a low level of compliance with labor-market regulations and a high level of unemployment and informal employment. Moreover, they have suffered from a volatile macroeconomic environment and financial crises (e.g., Brazil 1998-1999, Argentina 2000-2001, Turkey 2000-2001, and the global financial crisis in 2008). As a countermeasure, labor-market reforms toward greater efficiency have been discussed exhaustively by policymakers. The minimum wage has been front and center in these sessions, due to its widespread existence and long history in many developing parts of the world, such as Latin America and Indonesia (Eyraud and Saget, 2005).

The theoretical background of the literature on developing countries is largely drawn from the Welch-Gramlich-Mincer Two-Sector Models (Mincer, 1976; Welch, 1976; Gramlich, 1976). The empirical studies of such countries usually test whether an increase in the minimum wage has had a negative effect on employment in the covered sector and a positive effect in the uncovered sector, due to displaced workers in the former moving into the latter (Ehrenberg and Smith, 2009). The concepts "uncovered" and "informal" are in-

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[1] Some policymakers suggest regionalizing the minimum wage by taking the high variation of regional productivity into consideration. They claim that a minimum-wage floor could harm employment prospects of workers, particularly those in poor regions. See the recent report by Şeker and Küçükbayrak (2012) for a broad discussion of this issue. In their report prepared for the Turkish Ministry of Development, they identify the potential risks of a regional minimum wage as being "not negligible." Thus, regionalization does not seem to be an appropriate tool to benefit workers in poor regions.

[2] Many empirical studies of the minimum wage focus on specific demographic groups, such as teenagers or young adults, and implicitly assume that not all workers are affected by the minimum wage in the same way. For instance, teenagers generally represent the "low-wage group," whose wage depends directly on the minimum wage (Sen et al., 2011).

terchangeably applied when analyzing the relationship between employment and the minimum wage in developing nations (Saget, 2001).

Fajnzylber (2001) estimated the employment effects of the minimum wage in Brazil and reported negative employment elasticity for low-wage workers, which were around -0.1 and -0.25 for formal and informal salaried workers, respectively. The greater negative result in the informal sector was explained as a reflection of the higher motivation of informal salaried workers to seek a formal job. Alternatively, Fajnzylber proposed that, following a boost in the minimum wage, a number of non-head-of-household individuals may have quit the labor market, thanks to the increased earnings of other family members.

Maloney and Mendez (2004) examined Colombian panel data to evaluate the reference role of the minimum wage in determining other wages as well as its interaction with employment levels. They found a negative employment effect, accompanied by a strong *lighthouse effect* on wage distribution. However, their analysis was not able to cover the informal sector. Montenegro and Pagés (2005) assessed the effects of labor-market regulations like the minimum wage on different sub-groups in Chile, using a time-series of cross-sectional data sets from 1960 to 1998. Their results generally confirmed the standard competitive model, which predicts an adverse effect of the minimum wage on employment. Feliciano (1998) worked with a regional panel data specification for Mexico to estimate a state-variant minimum-wage effect. She found a disemployment effect on female workers, but no significant fallout for the male population. Bell (1997) compared Colombia and Mexico between 1981 and 1987, when the real minimum wage increased in the former and decreased in the latter. She found a significant disemployment effect of up to 12% in Colombia. Conversely, in Mexico, where there had been an eroded minimum age, the evidence did not show any significant effect. Gindling and Terrell (2009) examined the employment effect of the minimum wage in Honduras by studying minimum-wage variations there between 1990 and 2004. Their results showed that a 1% rise in the minimum wage reduced employment by 0.46% in medium and large-scale firms.

More recently, Majchrowska and Zolkiewski (2012) sought to estimate the employment effect of the minimum wage in Poland and confirmed that youth employment in that country was adversely affected by the minimum wage. In the case of Indonesia, where the minimum wage varies across provinces, Pratomo (2011) looked at what it did to employment, based on aggregate provincial panel data from 1989 to 2003. Although the results did not reveal any notable impact on total paid employment, a jump in the minimum wage was found to reduce employment in the covered sector, as predicted by the stand-

ard competitive model. Another study, by Alatas and Cameron (2008), esti-mated the sectoral employment effect of the sharp uptick in the Indonesian minimum wage between 1990 and 1996 with the help of a national household survey. They did not find a negative employment after-effect for large com-panies; nevertheless, they suggested that workers in small enterprises may suffer from job losses as a result of minimum-wage increases.

Whereas the research studies cited above reported negative follow-ups in employment figures from the minimum wage (or increases in it), other empir-ical studies failed to support these findings. Lemos (2009) considered the relationship in Brazil between the minimum wage and employment as well as wages; her source material was a monthly household survey panel from 1982 to 2000. She found no statistically significant contractionary ripples in the employment level caused by the minimum wage. In another study, Lemos (2004) took various minimum-wage variables to define the effect of a con-stant (national) minimum wage and came up with a measurable impact of the minimum wage on the employment level in Brazilian metropolitan regions between the years 1982 and 2000. This led her to conclude that an increase in the minimum wage does compress the distribution of wages but does not de-stroy that many jobs.

For their part, Hamidi and Terrell (1998) researched the situation in Costa Rica, in both the formal and informal sectors. Working with micro-data from the 1976-92 period, they concluded that a 1% increase in the minimum wage relative to the average wage led to an expansion in the covered sector's em-ployment of 0.56%. They also emphasized that their findings ran counter to the Two-Sector Models and instead supported the monopsonistic approach.

In a recent study, Bhorat et al. (2013) investigated sectoral minimum wag-es and employment in South Africa. They estimated the probability of remain-ing in employment with a difference-in-differences method. Contrary to the predictions of the standard competitive model, their results did not yield any significant negative outcome for employment in various sectors.

The evidence from Turkey has been particularly limited due to insufficient or non-available data. Papps (2012) examined the employment effects of in-creases in the social-security taxes paid by employers as well as rises in the minimum wage between 2002 and 2005. His results showed that higher so-cial-security taxes had a larger negative effect on the probability of a worker remaining employed in the next quarter than an equal-sized increase in the minimum wage. Using a basic time-series method, Korkmaz and Coban (2006) analyzed the relationships among the minimum wage, unemployment,

and inflation between 1969 and 2006. Their results pointed to no obvious reaction to the minimum wage on the part of the unemployment rate.

With impulse-response functions, Güven et al. (2011) assessed the relationship between employment and the minimum wage in Turkish manufacturing over the 1969-2008 period. They, too, found no proof of employment being affected by a minimum-wage change. However, it should be mentioned that impulse-response functions may not be an appropriate method for measuring the ramifications of the minimum wage, given its dependence on the choice of orthogonalization (Plosser, 1982). More recently, Bakış et al. considered the Turkish minimum-wage increase of 2004 and its effect on school-enrollment rates. They employed a non-linear difference-in-differences estimation and defined low- and high-impact regions in order to specify treatment and control groups. According to their results, the 2004 minimum-wage hike encouraged young people to sign up for continuing education, thereby reducing the labor supply. Similar to their identification strategy, we also rely on the regional variation of wages in Turkey.

The rest of this paper is organized as follows. The next section provides an overview of the data and briefly discusses the regional differences in the minimum wage in Turkey. The third section presents the model used for an empirical analysis of the effects of a national minimum wage on regional employment. The results are reported in the fourth section. Finally, the last section summarizes our main findings and concludes the paper.

2. Data and Summary Statistics

This paper is based on data coming from the Household Labor Force Survey (HLFS). This annual report, provided by TURKSTAT, is an individual and cross-sectional data set, so the interviewed sample changes each year. TURKSTAT has been publishing regional data at the NUTS1 (12 provinces) and NUTS2 (26 provinces) levels since 2004[3]. This is why 2004 is the starting year of our research period. In total, we have 286 observations, each region having been observed for 11 years.

Although the minimum wage is set nationally and is nominally identical throughout Turkey, the ratio of it to other wages varies across regions. In the literature, the commonly used minimum-wage measure, called the *Kaitz index*, is defined as the ratio of the minimum wage to the mean or median wage. This conventional index was first formulated by Kaitz (1970) and provides a

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[3]   The names of these regions were determined by TURKSTAT in the Nomenclature of Territorial Units for Statistics 2 (NUTS2), presented in Appendix A.1

basis for measuring where the minimum wage "bites." A lower Kaitz index is said to indicate that the minimum wage is relatively weak and probably does not affect a large number of employees, while a higher Kaitz index is generally associated with a higher minimum wage relative to other wages that may harm the labor market (Rycx and Kampelmann, 2012). This was borne out by Blázquez et al., 2009. Figure 1 presents the regional Kaitz indexes, obtained by dividing the nominal minimum wage by median wages in 2004 and in 2014 for 26 regions of Turkey [4].

Figure 1. The Kaitz Index in 2004 and in 2014 at Regional Level
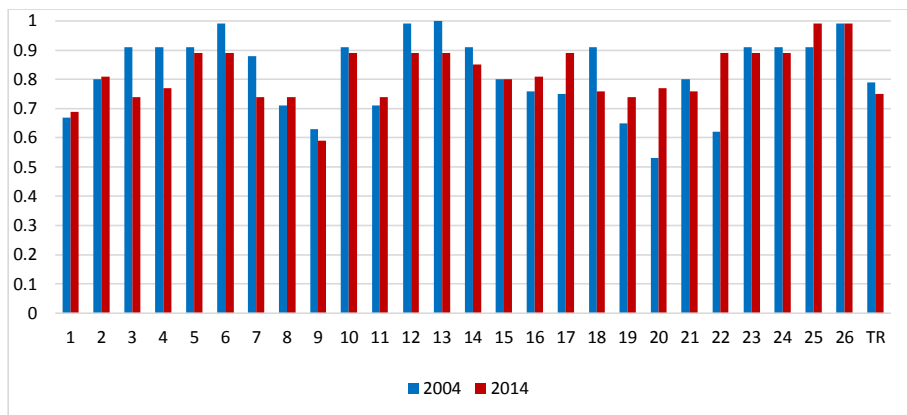
Source: Household Labor Force Surveys, own calculations

It should be noted that the Kaitz index is lower than the national average in industrialized districts, such as 8- Kocaeli or 16-Zonguldak, while it is higher than the national average in non-industrialized areas like 13-Hatay or 26-Mardin. Moreover, movement up or down in the Kaitz index was observed from 2004 to 2014 in each region, decreasing slightly in the aggregate. In the last year of the research period, the minimum wage reached parity with the median wage in two provinces: 25-Diyarbakır and 26- Mardin.

Under these circumstances, one can assume that the national minimum wage does not affect employment across regions uniformly. Although the nominal minimum wage is standard throughout the country, one can investi-

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[4] One can use both mean and median wages as denominators. Nevertheless, we keep in mind that using the median wage instead of the mean wage is widespread in developing countries, as it omits very high earnings (Maloney and Mendez, 2004). We also present the minimum wage/mean wage ratio of the NUTS2 regions in 2004 and in 2014 in Appendix A.2. Please note that using mean wages instead of median wages does not significantly alter the ratios.

gate empirically the effect of the minimum wage on employment by studying the minimum-wage/median-wage ratio at the regional level.

We focus on the working-age population below the age of 30. Even though the youth population is usually defined more narrowly ("teen" or 25 and below), we prefer to extend the age group. Among others, Bell (1997) maintains that it is crucial to include a wider age range than teens or youth below the age of 25 in minimum-wage studies of developing countries, since—unlike in the developed world—the teen population is not a plausible proxy for low-wage workers. In Turkey, employees aged 25-29 are overrepresented among workers who are paid exactly or near the minimum wage (Calavrezo and Pelek, 2011). Moreover, this age group has the highest rate of informal employment in Turkey (Bensalem et al., 2011). We seek to estimate the effects of the minimum wage not only on formal employment but also on the informal sector, keeping in mind that the latter is not negligible in the Turkish labor market.

3. The Empirical Model

In order to estimate the effect of the minimum wage on the employment of workers below 30 years of age, we use the following common specification form:

$$EMP_{it} = \alpha + \beta MW_{it} + \lambda X_{it} + f_i + f_t + \varepsilon_{it} \tag{1}$$

where EMP_{it} is the share of employees who are employed as wage earners in the total youth population in region i and year t. MW_{it} is the variable of interest that is supposed to capture the minimum-wage effect. We use the Kaitz index at the regional level as the minimum wage-variable. This index was the most preferred such variable in previous studies for its advantage of holding key information about the minimum wage within a single variable (Brown et al., 1982; Blázquez et al., 2009). It summarizes the information about both the level of the minimum wage compared with other wages and the degree of coverage. In addition to the variable of interest, we employ a set of control variables, X_{it}, to capture economic cycles, the prime-aged male unemployment rate—i.e., the unemployment rate of men who are aged between 30 and 45—and the regional CPI. We also control the supply side by adding the variable of the youth population rate in region i and year t; f_i and f_t are the region and year fixed effects, respectively. Finally, ε_{it} is the standard error term.

The minimum-wage literature on developing countries emphasizes that one has to pay particular attention to informal employment when researching the employment effect of the minimum wage in this part of the world. (Lemos, 2009). We expand our analysis by examining the influence of the

minimum wage over formal and informal employment separately. Consistent with the literature, we test the predictions of the Welch-Gramlich-Mincer Two-Sector Model. More precisely, we attempt to answer the following question: does the minimum wage contribute to informal employment, i.e., the employment in the uncovered sector, by propelling the displaced workers in the covered sector into the uncovered sector? In order to empirically test this prediction of the Two-Sector Model, once again we employ HLFS. One of the advantages of this data set is that the respondents are interviewed about their affiliation with the social-security system. Thus, we can identify whether the formal and informal employees have been registered in the social-security system by their employers or not. This definition of informal employment is in line with precedents in the literature as well as with the ILO's definition (Kanbur, 2009; Hussmanns, 2005; Bensalem et al., 2011).

We estimate the ratio of formal and informal salaried employees who are aged below 30 to total youth population in region i and year t. More formally, the estimated equations can be specified as follows:

$$F\_EMP_{it} = \alpha + \beta MW_{it} + \lambda X_{it} + f_i + f_t + \varepsilon_{it} \tag{2}$$

$$I\_EMP_{it} = \alpha + \beta MW_{it} + \lambda X_{it} + f_i + f_t + \varepsilon_{it} \tag{3}$$

where F_EMP_{it} and I_EMP_{it} refer to the ratio of formal and informal salaried employees to total individuals who are aged below 30, respectively. The independent variables remain the same as in Equation 1.

4. Results

4.1. The Effect of the Minimum Wage on Total Wage Employment

Table 1 presents estimated coefficients for Equation 1, where the dependent variable is the employment rate of young people (aged 15-29).

The estimated coefficient of the minimum-wage variable is not statistically significant. This primary result suggests that the minimum wage apparently has no disemployment effects on the employment of those workers comprising the most overrepresented group in the minimum-wage population. Thus, the predictions of the competitive model are not confirmed.

Therefore, we refine our analysis by re-estimating the employment effect of the minimum wage with regard to the productivity of workers. As is customary, we use educational attainment as a proxy for qualification. We re-estimate Equation 1 for the sub-groups specified by educational attainment. In this regard, we define three groups of education:

Table 1. Effects of the MW on Youth Employment

Dependent variable: wage-employment-to-population ratio of young people	
Variables	
The Kaitz Index	0.030 (0.196)
Prime-aged male unemployment rate	-0.183*** (0.068)
Regional CPI	0.001*** (0.000)
Ratio of youth to total population	0.530*** (0.122)
Constant	-0.109** (0.054)
Region FE	Yes
Year FE	Yes
Number of obs.	286
R-squared	0.709

Notes: significance levels; *** $p<0.01$, ** $p<0.05$,* $p<0.1$.
Standard errors in parentheses are corrected by the White (1980) procedure.

i. Low-educated workers: Primary and secondary-school graduates

ii. Medium-educated workers: General and vocational high-school graduates

iii. High-educated workers: University graduates

Table 2 reports the results obtained by estimating Equation 1 for the three groups of educational attainment specified above. The results are highly variable from one group to another. Firstly, the estimated coefficient of the minimum-wage variable is significantly positive for low-educated workers, while for the more educated groups no correlation is revealed. In other words, the minimum wage evidently does not decrease the wage employment/population ratio; conversely, a positive relationship between the wage employment rate and the Kaitz index emerges for low-educated workers. For the rest of workers, who are more educated, the relevance of testing the relationship between the wage employment and the minimum wage is not obvious. This is not surprising, since the minimum-wage workers in Turkey are mostly low-educated, as in other countries. The signs of the coefficients estimated for the control variables are more or less consistent with *a priori* expectations. However, these results should be viewed with caution, as the estimated equation in-

volves all wage employment and does not distinguish between formal and informal employment. In the next part of this section, we discuss the results from the model for formal and informal wage employment separately (Equations 2 and 3.

Table 2. Effects of the MW on Youth Employment by Educational Attainment

Variables	Low-educated workers	Medium-educated workers	High-educated workers
The Kaitz Index	0.103***	0.042	0.987
	(0.023)	(0.037)	(3.175)
Prime-aged male unemployment rate	-0.124*	-0.036	-0.238
	(0.072)	(0.136)	(0.260)
Regional CPI	0.001	0.001	0.530
	(0.001)	(0.001)	(0.529)
Ratio of youth to total population	0.591***	0.009	-0.767
	(0.171)	(0.233)	(0.798)
Constant	-0.328**	0.160*	0.377
	(0.131)	(0.093)	(0.365)
Region FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Number of obs.	286	286	286
R-squared	0.602	0.548	0.04

Notes: significance levels;*** p<0.01, ** p<0.05,* p<0.1.
Standard errors in parentheses are corrected by the White (1980) procedure

4.2. The Effect of the Minimum Wage on Formal Wage Employment

We report the results obtained by estimating Equation 2. The dependent variable is the formal wage employment rate among the working-age population below 30 years of age. Table 3 reports the estimated coefficients.

The estimated coefficient of the Kaitz Index is negative but insignificant. Once again, the estimated coefficients of the control variables have the expected signs. Similar to the previous section, we re-estimate the model for the three sub-samples specified by educational attainment separately in order to refine the analysis. The coefficients and standard errors are presented in Table 4. The results do not indicate any disemployment effects for the three sub-groups by educational attainment. The estimation results of the minimum-

Table 3. Effect of the MW on Formal Youth Employment

Dependent variable: formal-wage employment-to-population ratio of young people	
Variables	
The Kaitz Index	-0.009 (0.218)
Prime-aged male unemployment rate	-0.181*** (0.037)
Regional CPI	0.0002 (0.0004)
Ratio of youth to total population	0.077 (0.119)
Constant	0.089 (0.076)
Region FE	Yes
Year FE	Yes
Number of obs.	286
R-squared	0.707

Notes: significance levels;*** p<0.01, ** p<0.05,* p<0.1.
Standard errors in parentheses are corrected by the White (1980) procedure.

wage variable are not statistically significant, while they are negative for low-educated workers and positive for the rest.

4.3. The Effect of the Minimum Wage on Informal Wage Employment

The estimated results of Equation 3 are presented in Table 5. The dependent variable is re-specified as the informal wage employment rate among the youth population. The estimated coefficient of the Kaitz Index is positive and significant at the 1% level, indicating that a relatively higher minimum wage increases informal-wage employment.

We re-estimate Equation 3 for the two sub-samples specified by educational attainment: low-educated and medium-educated workers. The estimated coefficients and standard errors are reported in Table 6. We do not repeat the analysis for high-educated workers, since the informality rate among university graduates is negligible, even zero in some regions (Ben Salem et al., 2011). The limited number of observations of this sub-sample does not allow for statistically testing the relationship between the minimum wage and informal-wage employment in a reliable way.

Table 4. Effects of the MW on Formal Youth Employment by Educational Attainment

Variables	Low-educated workers	Medium-educated workers	High-educated workers
The Kaitz Index	-0.003 (0.023)	0.008 (0.044)	0.024 (0.081)
Prime-aged male unemployment rate	-0.129** (0.051)	-0.074 (0.001)	-0.188 (0.238)
Regional CPI	0.0007 (0.0005)	0.001 (0.001)	-0.0006 (0.002)
Ratio of youth to total population	0.065 (0.144)	-0.288 (0.172)	-0.114 (0.383)
Constant	-0.029** (0.094)	0.231* (0.117)	0.556** (0.263)
Region FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Number of obs.	286	286	286
R-squared	0.411	0.583	0.202

Notes: significance levels;*** $p<0.01$, ** $p<0.05$,* $p<0.1$.
Standard errors in parentheses are corrected by the White (1980) procedure.

The estimated coefficients indicate that the minimum-wage-to-median-wage ratio increases the informal paid employment of the youth population with low and medium educational levels. This result is in line with the predictions of the Two-Sector Model. We find evidence of a positive relationship between the relatively higher minimum wage and the informal employment rate. However, it should be noted that the magnitudes of estimated coefficients appear to be weak. The coefficients of the control variables are more or less significant, and their signs are consistent with the theoretical predictions.

To conclude, the obtained results demonstrate that the minimum wage does not appear to have a negative impact on employment for the specific young age group of 15-29. However, the informal-employment-to-population ratio of this age group is affected significantly by the minimum wage. The results become clearer when we re-estimate the employment to population ratios separately for the sub-samples identified by educational attainment. In this specification, the estimated coefficients of the minimum-wage variables are statistically insignificant when the dependent variable captures formal employment. In addition, the informal employment rate tends to be boosted by the minimum wage. All in all, econometric results do not indicate any

Table 5. Effect of the MW on Informal Youth Employment

Dependent variable: informal-wage-employment-to-population ratio of young people	
Variables	
The Kaitz Index	0.077*** (0.015)
Prime-aged male unemployment rate	0.065 (0.056)
Regional CPI	0.001 (0.001)
Ratio of youth to total population	0.417*** (0.140)
Constant	-0.288*** (0.101)
Region FE	Yes
Year FE	Yes
Number of obs.	286
R-squared	0.420

Notes: significance levels;*** p<0.01, ** p<0.05,* p<0.1.
Standard errors in parentheses are corrected by the White (1980) procedure.

disemployment effect of the minimum wage on total employment. The evidence only suggests that the low informal employment rate of low- and medium-educated Turkish workers who are aged between 15 and 29 is correlated with the minimum wage over the period 2004-14 period.

5. Concluding Remarks

Using regional data, this paper examines the employment effects of the minimum wage in Turkey. We investigate whether the national minimum wage has affected the employment rates of workers aged 15-29 by taking regional disparities into account. We prefer to focus on this age group, since they are overrepresented among minimum-wage earners. The study covers the period from 2004 to 2014. We use the Kaitz Index at the regional level as the minimum-wage variable in order to capture the regional differences in the minimum wage compared to other wages. According to the results, the minimum wage is apparently not a factor that worsens employment. We repeat the analysis for three sub-samples defined by educational attainment. Once again, the results indicate that the minimum wage and the employment level do not exhibit any negative correlations. These results are in line with the *new mini*

Table 6. Effects of the MW on Informal Youth Employment by Educational Attainment

Variables	Low-educated workers	Medium-educated workers
The Kaitz Index	0.089*** (0.021)	0.055** (0.022)
Prime-aged male unemployment rate	0.057 (0.065)	0.050 (0.051)
Regional CPI	0.0008 (0.010)	0.0009 (0.0006)
Ratio of youth to total population	0.428** (0.163)	0.206* (0.111)
Constant	-0.263** (0.099)	-0.166*** (0.055)
Region FE	Yes	Yes
Year FE	Yes	Yes
Number of obs.	286	286
R-squared	0.285	0.470

Notes: significance levels;*** $p<0.01$, ** $p<0.05$,* $p<0.1$.
Standard errors in parentheses are corrected by the White (1980) procedure.

mum-wage research, which questions the conventional wisdom of rises in the minimum wage causing without exception a shrinkage in total employment.

In order to clarify the empirical analysis, we also distinguish the employment type according to the social-security coverage of employees. We estimate the effect of the minimum wage on regional formal and informal wage employment rates, respectively.

The results do not justify blaming the minimum wage for reductions in formal employment. Nevertheless, a positive correlation between the minimum wage and informal wage employment is confirmed. Thus, one can suggest that the predictions of the standard Two-Sector Model are partially valid for explaining the effects of the minimum wage on the Turkish labor market. Indeed, informal wage employment grows significantly in response to changes in the minimum wage, not only among low-educated workers but also for medium-educated ones. However, the evidence from Turkey should be strengthened by different data sets, such as individual panels or corporate-level data. Furthermore, new theoretical approaches modeling the correlation between the minimum wage and informal employment will also be welcome,

given that the Two-Sector Model only gives a partial explanation of the effects of the minimum wage on employment in Turkey, a developing economy.

Appendix

A. 1. NUTS 2 Regions in Turkey

1	TR10	İstanbul
2	TR21	Tekirdağ, Edirne, Kırklareli
3	TR22	Balıkesir, Çanakkale
4	TR31	İzmir
5	TR32	Aydın, Denizli, Muğla
6	TR33	Manisa, Afyon, Kütahya, Uşak
7	TR41	Bursa, Eskişehir, Bilecik
8	TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova
9	TR51	Ankara
10	TR52	Konya, Karaman
11	TR61	Antalya, Isparta, Burdur
12	TR62	Adana, Mersin
13	TR63	Hatay, Kahramanmaraş, Osmaniye
14	TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir
15	TR72	Kayseri, Sivas, Yozgat
16	TR81	Zonguldak, Karabük, Bartın
17	TR82	Kastamonu, Çankırı,Sinop
18	TR83	Samsun, Tokat, Çorum, Amasya
19	TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
20	TRA1	Erzurum, Erzincan, Bayburt
21	TRA2	Ağrı, Kars, Iğdır, Ardahan
22	TRB1	Malatya, Elazığ, Bingöl, Tunceli
23	TRB2	Van, Muş, Bitlis, Hakkari
24	TRC1	Gaziantep, Adıyaman, Kilis
25	TRC2	Şanlıurfa, Diyarbakır
26	TRC3	Mardin, Batman, Şırnak, Siirt

A. 2. Minimum Wage/Mean Wage Ratio in 2004 and in 2014
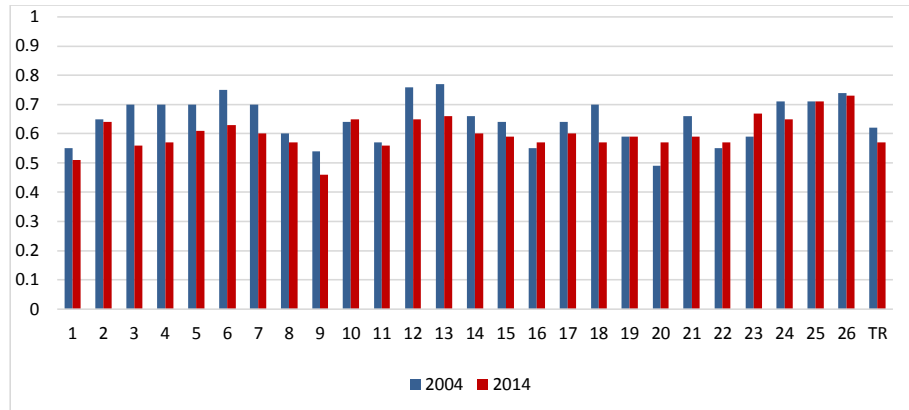
Source: Household Labor Force Surveys, own calculations.

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DOES BROADBAND FACILITATE IMMIGRATION FLOWS? A NON-LINEAR INSTRUMENTAL VARIABLE APPROACH

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Abstract

This paper investigates whether ICT facilitates migration flows from any one OECD member country to others, and from non-OECD to OECD countries. Among various ICT tools, we primarily focus on broadband. Our instrumental-variable model derives its non-linear first stage from a logistic diffusion model, where pre-existing voice-telephony and cable-TV networks predict maximum broadband penetration. The selection of both OECD- and non-OECD-origin countries, governed by the availability of the data, is based on the magnitude of the flows, leading us to examine those with a minimum number of 100 people (threshold 0.1) who are migrating from source to host, followed by 300 (threshold 0.3) and 500 (threshold 0.5) people. By looking at the efficacy of ICT connections, we intend to fill the gap in the literature on the relationship between communication facilities and migration decisions. We find a strong and positive effect of broadband on migration flows between 1995 and 2009. This effect is more prominent for non-OECD to OECD-country pairs. The larger the threshold, the better the results.

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1. Introduction

Currently, 232 million people, who represent approximately 3.6% of the world population, are living outside their countries of origin. According to the International Organization for Migration (IOM) Report (2013), the growth in the number of immigrants between 2000 and 2010 was double that of the previous decade. This figure is slightly higher in Europe than in the US. With such great numbers of people choosing to live outside their homelands, our curiosity turns to the reasons behind one's decision to migrate.

In this regard, we intend to investigate the intra-OECD movements (hereafter OtO), as well as from the non-OECD region to the OECD one (hereafter non-OtO). The main host countries here are Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Luxembourg, the Netherlands, Norway, Poland, Spain, Sweden, and the UK, and their selection by us was based on the availability of the data.

Throughout the literature, multiple economic, political, and social aspects have been pointed out as factors in individuals' decision to emigrate abroad; these are, chiefly, wages, employment and unemployment rates, inequality, GDP per capita/GDP level, population/population density, trade, immigration law, and educational attainments. We find it surprising that the levels of ICT facilities in both the origin and the host countries have not been considered as a determinant, given the dominance this assumes in the life of an immigrant abroad eager to engage in information exchange with those back home. Also and more importantly, we believe that ICT connections foster follow-up flows of migrants to the developed world by improving access to information (much of it from previous immigrants now living there) about the better life awaiting them there if they decide to move.

In this paper, we look at the role of ICT connections in encouraging migration; we also examine a number of economic aspects for possible inclusion as factors in a person's decision to move abroad. In order to do this, we will confine ourselves to the number of people aged 15-64 going from the origin to the receiving country, obtained from the OECD; controlled for the employment rate in the host country and the unemployment rate in the origin country (Eurostat); real Gross Domestic Product per capita (GDP); broadband, cable-TV and voice-telephony subscription penetration rates (International Telecommunications Union, ITU); the average wage across industries (OECD's Occupational Wages around the World, OWW) in the host country; and the distance between the origin and host countries (CEPII, Mayer and Zignago, 2011). A dummy variable to capture institutional features, FREE, is equal to 1 if an individual has free access to the host country (Eurostat, EEA). Since the

data capture both time-series and cross-sectional components, a panel data analysis will be undertaken. By including ICT connections, we intend to fill the gap in the literature that would outline the relationship between communication facilities and migration decisions, and we expect to find a significant effect of such for both OtO and non-OtO flows between 1995 and 2009.

The paper proceeds as follows. Section 2 represents a literature review. Section 3 presents the data analysis and estimated model. Section 4 discusses endogenous variables, non-linear instrumental variables, the validity of instruments, certain robustness checks, and the analysis results. Finally, Section 5 presents the conclusion.

2. Literature Review

From prehistoric to modern times, human beings have always been on the move. This means that the history of migration coincides with the history of humanity. By and large, it may appear that individuals move to better and safer places, but what is a better and safer place? Is this criterion sufficient to encompass the many possible reasons behind individuals' decisions to move elsewhere? Lewis (1954) pointed out that a necessary condition for someone to migrate is the availability of adequate earnings in the host country. More generally, the direction of movement is from low-earning to high-earning countries (Massey *et al.*, 1994). Chiswick (1999) claimed that the relative wage difference between the host and origin countries and both direct and indirect migration costs determine the approximate rate of return from migration, and the greater this rate, the more probability the person will migrate.

Furthermore, Greenwood (1975) surveyed the literature up to the 1970s and showed that certain aspects played into the decision to migrate, such as distance, the earnings of other immigrants there, networking, the cost of migration, and the characteristics of a typical immigrant in the target country. Greenwood (1985) conducted another survey to cover the period leading up to the 1980s and found that, in addition to the factors listed in his first survey, labor-market conditions, taxation policies, and environmental features in the host country, personal job skills, and individual circumstances, such as education, age, gender, and marital status, are essential determinants of migration.

Migration is a matter of self-selection. In this regard, the majority of labor economists follow Roy's (1951) self-selection model, which is based on the assumption that humans' decisions to participate in job markets depend on whatever ability they have, the technology to be applied, and the correlation between these factors in a community where there are only two occupations

available. Although Roy's model captures a simple case, it provides a basis for decision-making problems, such as job, location, and education.

Borjas (1987, 1989), for instance, launched the first extension to Roy's model, stating that the earnings of immigrants across multiple skill groups are a main attractant to other would-be immigrants. His theory holds if the value of logged wages in the host outweighs the logged value of wages in the origin country, plus migration cost. Niedercorn and Bechdolt (1969) looked at the gravity model, using the framework of utility theory. Variables included in this theory are the population of the host nation, the finite number of journeys planned, the period of time that will be spent in the host, and the sum of money that will be needed for this journey from a single origin country to multiple host countries.

The most general form of the gravity model was given by Vanderkaup (1977): the level of immigration flows depends upon the relative populations in the origin and host countries and the distance between the two. Rodrigue *et al*. (2009) took a different approach to this model, describing it as a physical science (also known as Newton's Law) and commenting that if the importance of one location increases across any two locations, there will also be a jump in movement between those two locations. Here, the importance of the location is measured by population, GDP level, employment, unemployment, poverty, or other appropriate variables.

This gravity model departs from Niedercorn and Bechdolt's (1969) version in that the importance of a country is not defined by population only, but also captures GDP, labor-market conditions, and other relevant factors. Thus, we can state that a general assumption of the gravity model of migration is that the greater the relative importance of the origin and host countries, the more the migration. A gravity model mainly focuses on the prominence of a country within country pairs and can be adjusted to other migration theories, depending upon which aspects of decision-making are to be analyzed. Thus, this paper will use the gravity approach.

Hypothetically, a number of economic constraints, such as overall economic hardship, poverty, a low standard of living, insufficient wages, wage inequalities, failing infrastructure and dystopian social factors, such as wars, famine, drought, and other natural disasters, act as inducements for those affected to flee abroad. This paper intends to focus exclusively on the economic factors. While each man's or woman's own personal expectations motivate him or her to leave the homeland, other external realities also play a critical part in the decision: social ties, affiliations, or, simply, the dream of a better standard of living (Jong, 2010). Researchers have identified employment op-

portunities and a high future level of income as key incentives to move away (Daniels and Ruhr, 2003; Sorhun, 2011).

When contemplating emigration, people focus on places with a high potential of finding a job so that they can start earning money for survival soon after arrival. Widespread unemployment and a low share of GDP per capita at home are also major prods to looking elsewhere for a place to settle (Feridun, 2007). More specifically, failure to find work within a certain period of time pushes individuals to look at other locations, ones with lower unemployment rates. On the other hand, the distance between the origin and receiving countries is deemed to be a key deterrent (Mayda, 2008; Sorhun 2011); i.e., greater distance requires more cost of travel as well as more risks. As such, with the ongoing turmoil in several Middle East countries like Egypt, Libya, Yemen, and, most dramatically, Syria, multiple nationalities are streaming towards Turkey, which does not have the desired level of economic growth to put it in the same category as a developed European country but is nevertheless the destination of those fleeing neighboring states (Sirkeci and Esipova, 2013).

Severe unemployment and wide earnings differentials also figure in the decision to move to a better off region, as is borne out in not only cross-national but also interregional migration studies (Pissarides and McMaster, 1990). Furthermore, Sorhun (2011) examined the economic size of the receiving country as another magnet for migrants, as well as the association of income level with the migration decision in the case of Turkey's internal/external migration.

Zavodny (1999) investigated location choices within six states of the US and found that people desired to live in those states that they perceived as more beneficial for them. For those living in a hugely populated country, grinding poverty and "unpleasant" environments are most often cited as what prompted emigrants to head away from home (Amacher *et al*., 1998). Indeed, living under such conditions inevitably propels people outward, not necessarily to the best, but at least better, places. Deciding on a host country is also done in the hope of gaining the greatest return on human capital (Stark and Taylor, 1991). GDP per capita both in the origin and receiving countries is found to be another criterion that is weighed when deciding whether to stay or go—and where to go (Marques, 2010).

Overall, the decision to migrate depends both upon an immigrant's unique characteristics and the general labor-market conditions in the home country (Pissarides and Wadsworth, 1989). So far, the majority of the factors believed to be motivating migration have been identified. In general, we can state that a

person will leave his home country if the perceived benefit in doing so outweighs any benefit of staying put.

Now that we are living in the 21st century, where telecommunications have assumed a central role in everyone's life, enabling him or her to keep in touch with family members and friends back home and exchange information between the old and new locations, telecommunications as a separate factor in triggering migration flows deserves investigation. Thus, this chapter will analyze whether there is such a relationship between migration flows and telecommunications, and, if so, fill in the gap in the migration literature.

As this paper is to adopt the Gravity Model of Migration, the related literature is followed in more detail and shown in Table 1. As is seen in the table, to the best of our knowledge, no gravity model includes telecommunications facilities as a determinant of migration. Telecommunications facilities are regarded as a tool to measure a country's wealth in relation to GDP, but not as one that improves the flow of information on host countries such that it fosters emigration from poorer places. Our gravity model will allow us to detect such mobility in flows from origin to host in relation to the availability of telecommunications facilities.

As seen in the table, in almost all cases, distance is a significant disincentive, as the greater the distance, the higher the risk and the migration cost. Better wages, high GDP per capita, and little unemployment (or a high employment rate) in the host country are found to be the main motivating factors in deciding where to migrate to. Our results in Section 3 will also demonstrate how these considerations play a leading role in choosing where to move to.

3. Data and Empirical Model

The empirical analysis employs a panel of data from a sample of inflows in thousands from origin country i to host country j at time t. The main host countries here are Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Luxembourg, the Netherlands, Norway, Poland, Spain, Sweden, and the UK, covering the years between 1995 and 2009. OECD-origin countries are mainly: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, the Netherlands, Norway, Poland, Slovakia, Estonia, Sweden, Turkey, and the UK. Non-OECD-origin countries, on the other hand, are Algeria, Armenia, Bosnia-Herzegovina, Bulgaria, China, Egypt, Morocco, Nigeria, Pakistan, Romania, Russia, Tunisia, and Ukraine.

Table 1. Gravity Models Through the Literature

Author(s)	Geographical units and sample period	Methodology	Dependent variable	Significant explanatory variables
Karamera *et al.* (2000)	19 European, 16 African, 16 Asian, 2 North American, 3 Central American, 3 Caribbean, 12 South American countries to North America; 1976-1986	Panel with time- and country-pair fixed effects and origin-region dummies	Total migration inflows	(+): Population (origin), income (origin + host), unemployment (host), business credit ratings (origin), relative freedom (origin), common border, population density. (-): Distance, population (host), inflation (origin), political instability (origin), political rights (origin), civil liberty (origin), immigration policy.
Mayda (2008)	Migration to 14 OECD countries: Australia, Belgium, Canada, Denmark, France, Germany, Japan, Luxembourg, Netherlands, Norway, Sweden, Switzerland, UK, US;1980-1995	Panel OLS with individual-country dummies	Emigration rate	(+): Per worker GDP (host), young population (origin). (-): Distance.
Beine *et al.* (2006)	Migration to OECD countries; 1990 and 2000	Panel OLS with dummy for 2000	Skilled migrant inflows	(+): Distance, GDP per capita ratio, social expenditure (host), democracy index (origin), public-education expenditure (origin). (-): Linguistic proximity, education expenditures (host), openness to immigration.
Shen (1999)	Chinese provinces; 1985-1990	Panel OLS	Total migration flows	(+): Population (origin), GNP growth rate (origin + host). (-): Distance, illiteracy (host), agricultural employment (origin + host), population growth (origin), population density (origin + host).
Pedersen *et al.* (2008)	Migration to OECD countries; 1990-2000	Panel fixed effects for host, WLS and GEE with host- or country-pairs dummy	Total migration inflows	(+): Stock of immigrants, common border, common language, colony dummy, trade volume, relative population (host origin), social expenditure (host), (-): Distance, GDP per capita (origin + host), unemployment (host), illiteracy (origin), freedom house index (origin).
Helliwell (1997)	From US to Canada, within Canada; 1991	Cross-section OLS	Total migration inflows	(+): Population (origin + host), real personal income (host). (-): Distance, real personal income (origin).
Kumo (2007)	Flows within Russian regions; 2003	Cross-section OLS	Total migration flows	(+): Population (origin + host), gender ratio, paved roads, common border, some regional dummies. (-): Distance, below-working-age ration, some regional dummies.
Ashby (2007)	Interregional flows within 48 US states; 2000	Cross-section with spatial dependency	Migration rate	(+): Relative economic freedom, relative population, relative income, relative employment growth, relative retired, relative heating days, distance squared. (-): Distance, relative precipitation, relative density, dummy for movers.
Fertig (2001)	Flows from 17 OECD countries into Germany; 1960-1994	Panel GLS with origin-country dummies	Migration rate	(+): Per capita income ratio, employment (host), free movement dummy. (-): Lagged migration rate, employment (origin).
Marques (2010)	Flows from Central and Eastern Europe to EU:15 countries; 1986-2006	Panel fixed effects for host with region dummies	Total migration flows	(+): GDP (origin + host), GDP per capita (origin), current migration stock, contiguity, common language, liberal policy reform (host), some regional dummies. (-): GDP per capita (host), unemployment (origin), political environment (host), distance, some regional dummies.
Andrienco and Guriev (2004)	Interregional migration in Russia; 1992-1999	Panel OLS with time dummies and region-pairs fixed effects	Number of people who migrate	(+): Income per capita (host), unemployment rate (origin), poverty (origin), public-goods provision (host). (-): Distance, income per capita (origin), unemployment rate (host), poverty (host), public-goods provision (origin).
Lewer and den Berg (2008)	General	Joint hypothesis of cross-section	Level of immigration	(+)population (origin) x population (host), common language, colonial link between host and origin, relative distance to income per capita in the origin, immigrants in the host. (-) distance.

As an international telecommunications channel, we expect broadband to present as the most convenient communication tool, as it is cheap and allows job applications to be submitted and job interviews to be conducted from overseas. In order to capture both ICT connections and a number of economic aspects as reasons for individuals' decision to migrate, the following gravity model will be applied:

$$\log FLOWS_{ij,t} = \log \beta_1 ICT_i + \log \beta_2 ICT_{j,t} + \beta_3 \log DIST_{ij} + \beta_4 \log RGDP_{ij,t}$$
$$+ \beta_5 \log WAGE_{j,t} + \beta_6 UNEMPR_{i,t} + \beta_7 EMPR_{j,t} + \varepsilon_{ij,t} \qquad (1)$$

where $FLOWS_{ij}$ is the flow of immigrants in thousands. Here, we grouped migration flows into three thresholds that are equal to and greater than 0.1, 0.3, and 0.5 (i.e., 100, 300, and 500 people or more), both for OtO country pairs and non-OtO; ICT_i, ICT_j are ICT connections in the origin and host, respectively; $DIST_{ij}$ is the distance between the origin and host country; $RGDP_{ij}$ is the relative real GDP (i.e., $\dfrac{RGDP_i}{RGDP_j}$ both real GDP in the origin—$RGDP_i$— and real GDP in the host—$RGDP_j$— are constant in US\$ in the year 2000); $WAGE_j$ is the average wage across industries in the host country, all adjusted to US\$ in the year 2000; $UNEMPR_i$ is the unemployment rate in the origin; $EMPR_j$ is the employment rate in the host; and ε_{ij} is the error term. Throughout the literature, technology is assumed to evolve along an exponential growth curve (Griliches, 1957; Geroski, 2000; Gruber and Verboven, 2001; Comin *et al.*, 2006; Czernich *et al.*, 2011); thus, ICT connections in origin and host can be written as:

$$ICT_{it} = \alpha_1 e^{\lambda_{it}} \text{ and } ICT_{jt} = \alpha_2 e^{\lambda_{jt}} \qquad (2)$$

where λ_{it} and λ_{jt} are the growth parameters of the rate of the ICT tool in the origin and host country, respectively. In our analysis, we primarily focus on broadband as an ICT tool for the reasons we explain in Section 4. Broadband here is counted from 256kbit/s to under 2Mbit/s. Since migration occurs between specific country pairs, we focus on the relative broadband penetration rate within those country pairs. Thus, it can be written as:

$$BROAD_{ij,t} = BROAD_{it} x BROAD_{jt} \qquad (3)$$

Based on equation (2), $BROAD_{ij,t}$ takes the exponential form of:

$$BROAD_{ij,t} = \alpha^* e^{\lambda^*_{itj}} \tag{4}$$

Here, $BROAD_{ij}$ is defined as the multiplication of the broadband penetration rates in the origin and host country at time t. There is no previous literature to guide us as to how to set up a country-pair specific variable suitable for this transaction. However, since communication is a form of information exchange, and broadband in particular is our communication variable, we decided to concentrate on such interaction variables. Given that broadband (as an example) may have been introduced into Country A (origin) two years later than into Country B (host), the resultant interaction variable will enable us to observe what happens after A and B have broadband at the same time. We cannot present them in the form of fractions since there is the possibility of either of the broadband variables being zero (e.g., broadband has not been introduced yet). Since the sample has a mix of core EU countries and later entrants (in 2004, Czech Republic, Hungary, Poland, and Slovakia), as well as more recent accession countries (in 2007, Bulgaria and Romania), we control for the legal restriction of traveling/staying and working in the host country by setting up a dummy variable $FREE_{ij}$ that is equal to 1 if there is no such restriction on moving from the origin to host country, 0 otherwise.

In order to visualize the various effects of broadband penetration across country pairs, we also control for the catching-up in broadband diffusion by including the years since broadband introduction has been introduced into country pairs, $T^B_{ij,t}$ (Gruber and Verboven, 2001; Czernich *et al.*, 2011), where B represents the broadband penetration rate between country pairs (i.e., $BROAD_{ij}$). The calculation of $T^B_{ij,t}$ is made based on the broadband penetration rate, and it is the number of years that both parties in a country pair have had broadband. After the addition of time and country-pair subscriptions, the complete estimation equation will be as follows:

$$\log FLOWS_{ij,t} = \beta_0 + \beta_1 BROAD_{ij,t} + \beta_2 \log DIST_{ijt} + \beta_3 \log RGDP_{ijt} + \beta_4 \log WAGE_{jt}$$
$$+ \beta_5 UNEMPR_{i,t} + \beta_6 EMPR_{j,t} + \beta_7 FREE_{ij,t} + \beta_8 T^B_{ij,t} + \delta_{ij} + \theta_t + \varepsilon_{ij,t} \tag{5}$$

Where δ_{ij} and θ_t are the country-pair effects and the time-fixed effect, respectively. When the independence of irrelevant alternatives fails to characterize the reasons behind individuals' thinking on migration, the benefits of migrating to certain destinations take center stage: this is called multilateral

resistance to migration (Bertoli and Moraga, 2013). In the presence of this phenonomen, several studies have adopted the Common Correlated Effects (Pesaran, 2006) or have used *ad hoc* controls for the time-varying benefits of migration, or they have provided more restricted assumptions when specifying the estimated model.

In light of every gravity model's having more than one origin country as well as more than one destination country, we must limit ourselves to the relationship among specific country pairs (Anderson and Van Wincoop, 2001). In this paper, the specification of our main independent variable is in an interaction form (i.e., $BROAD_{ij,t} = BROAD_{it} x BROAD_{jt}$). By doing so, we believe we account for the relative attractiveness of the country pairs sampled. However, additional methods could be adopted for follow-up robustness checks in the future. See Table 2 below for a detailed description of the data.

Descriptive statistics for each variable are presented in Appendix B's Table 11 and Table 12, featuring OtO and non-OtO country pairs, respectively. The number of individuals leaving origin nations for host countries is around 4,058 every year. The employment rate in the host countries in the OtO group averaged around 0.69 between 1995 and 2009. In the non-OtO countries, the comparable figure was 0.65 for the same period. The unemployment rate was about 9% in origin countries as a whole.

As the broadband penetration rate is measured with the multiplication of the broadband penetration rates in origin and in host countries, the average rate for this variable is approximately 2%. The average wage (in US dollars in 2000) ranged from $944 to $27,641 per year.

Table 2. Data and Origins

Notation	Variable	Unit	Origin
$FLOWS_{ij}$	Inflows of foreign population, aged 15-64, by nationality	Thousands	OECD
$BROAD_i$	Broadband penetration rate in origin	256 kbit/s to less than 2Mbit/s Share of the population that has subscribed to broadband	ITU (International Telecommunication Union) ICT Database
$BROAD_j$	Broadband penetration rate in host	256 kbit/s to less than 2Mbit/s Share of the population that has subscribed to broadband	ITU (International Telecommunication Union) ICT Database
TEL_i	Fixed-telephone subscriptions in origin	Per 100 inhabitants	ITU (International Telecommunication Union) ICT Database
TEL_j	Fixed-telephone subscriptions in host	Per 100 inhabitants	ITU (International Telecommunication Union) ICT Database
$CABLE_i$	Cable-TV subscribers in origin	Per 100 inhabitants	ITU (International Telecommunication Union) ICT Database
$CABLE_j$	Cable-TV subscribers in host	Per 100 inhabitants	ITU (International Telecommunication Union) ICT Database
$DIST_{ij}$	Distance between origin and host	Km	CEPII
$RGDP_i$	Real GDP in origin	Constant US$ as of 2000	World Bank, World Development Indicators
$RGDP_j$	Real GDP in host	Constant US$ as of 2000	World Bank, World Development Indicators
$WAGE_j$	Average wage across industries in the host	Total wage across industries divided by number of total employees in the industries (All LCU adjusted to US$ in 2000)	OECD STAN Database, OWW Database for the UK, (ECB) European Central Bank Statistical Data Warehouse for US dollar exchange rate
$UNEMPR_i$	Unemployment rate (origin)	Total, % of total labor force, in millions	IMF
$EMPR_j$	Employment rate (host)	Percentage (total gender, aged 20-64)	Eurostat
$FREE_{ij}$	=1 if no legal restriction on living, working in host	0.1	Author calculation based on Eurostat-EEA
$T_{ij,t}^B$	Years since country pairs both first introduced broadband	Varies from 0 to 10 for OtO Varies from 0 to 8 for non-OtO	Author calculation based on ITU (International Telecommunication Union) ICT Database

Compared to the OtO flows, non-OtO flows could be much higher—up to 261,273 men and women per year—but, on average, it hovered around 5,700. The rate of unemployment in the non-OECD-origin countries typically goes from a low of 2.9% to a crushing high of 38.4%.

3.1 Causality of Broadband and Migration Flows

The basic gravity model may suffer from different origins of endogeneity. One concern is reverse causality: when considering the origin and host countries, we might imagine that the greater the flows of people from origin to host, the more the communications will be directed from host to origin, as migrants talk to family and friends: we will discuss this in more detail in Section 4.1.

In order to address several sources of endogeneity bias in the model, we adopted Czernich *et al.*'s (2011) instruments for the IV approach. Since broadband platforms rely on either the copper wire of voice telephony or the coaxial cable of cable TV between households and the main distribution frame, we designated the ceiling of broadband penetration as η_{ij} with voice telephony and cable TV for the year 1997, which is the year before broadband was first introduced to both countries among country pairs at the same instant:

$$\eta_{ij} = \eta_0 + \eta_1 VOICE_{ij,1997} + \eta_2 CABLE_{ij,1997} \tag{6}$$

Here we use the number of non-digital telecommunications access lines in 1997 ($VOICE_{ij,1997}$) and the number of cable-TV subscribers in 1997 ($CABLE_{ij,1997}$) to measure the spread of the traditional telecommunications and cable networks in country pairs, calculated as:

$$VOICE_{ij,1997} = VOICE_{i,1997} \times VOICE_{j,1997} \tag{7}$$

$$CABLE_{ij,1997} = CABLE_{i,1997} \times CABLE_{j,1997} \tag{8}$$

Where $VOICE_{i,1997}$ and $VOICE_{j,1997}$ are the number of non-digital telecommunications access lines per 100 inhabitants in 1997, in the origin and host countries, respectively; $CABLE_{i,1997}$ and $CABLE_{j,1997}$ are the number of cable-TV subscribers per 100 inhabitants in 1997, in the origin and host countries, respectively. These variables were obtained from the ICT Indicators Database of the International Telecommunication Union (ITO). Although $VOICE_{ij,1997}$ and $CABLE_{ij,1997}$ are time-invariant variables, Stata 13's *nl* (i.e., non-linear) command provides time-invariant coefficients for each of these variables. The majority of researchers have followed the logistical growth curve for a new technology, defined by Griliches (1957) (among them, Gruber and Verboven,

2001; Comin *et al*., 2006; Geroski, 2000; Czernich *et al*., 2011; Stoneman, 2002; Beck *et al*., 2005; and Michal and Tobias, 2006):

$$BROAD_{ij} = \frac{\eta_{ij}}{1 + e^{-[\beta(t-\tau)]}} \tag{9}$$

Again, $BROAD_{ij}$ is the broadband penetration rate, measured as the multiplication of the share of the population that has subscribed to broadband in the origin and the share of the population that has subscribed to broadband in the host (i.e., $BROAD_i \times BROAD_j$), whereas η_{ij} determines the maximum broadband penetration rate, β is the diffusion speed, and τ is the inflexion point. Inserting Equation 6 into Equation 9, we obtain the following non-linear first-stage equation:

$$BROAD_{ij,t} = \frac{\eta_0 + \eta_1 VOICE_{ij,1997} + \eta_2 CABLE_{j,1997}}{1 + e^{-[\beta(t-\tau)]}} \tag{10}$$

By applying such a non-linear least-squares estimation, we compute the predicted broadband penetration rate with absolute exogenous factors. In order to receive consistent estimates from the second stage of the nonlinear equation, the first-stage estimation must be specified correctly (Angrist and Imbens, 1995; Angrist and Kruger, 2001a, 2001b). To obtain the fit of the first stage of the diffusion curve of the instrumental model, we plot the graphs of actual and predicted broadband for OtO and non-OtO country pairs for each threshold. However, we only present 10 country pairs for each threshhold, as there are 366 OtO country pairs (148 + 118 + 100) and 269 non-OtO country pairs (101 + 92 + 76) in total, and it would require too much space. Figure 1 to Figure 6 present the actual and predicted broadband penetration rates (see Appendix A).

For OtO country pairs with 0.1 thresholds, Poland-UK and Germany-Austria appear to have a perfect fit of actual and predicted broadband penetration rates. On the other hand, the predicted broadband penetration rates for the Netherlands-Belgium, Sweden-Norway, and Belgium-Luxembourg country pairs seem slightly below the actual ones. The actual and predicted values for the rest of the country pairs, for the most part, apparently conform. The same pattern holds for OtO country pairs, with 0.3 and 0.5 thresholds.

When it comes to non-OtO country pairs with 0.1 thresholds, Algeria-France, Russia-Germany, Bosnia-Herzegovina-Austria, and Bulgaria-Spain appear to fit well, whereas the rest of the country pairs have predicted values

coming under the actual rates. All in all, we can see a diffusion-curve shape for all country pairs, as expected, which confirms the fit of the first stage of the diffusion curve, corresponding to much of the literature on technology diffusion (Griliches, 1957; Geroski, 2000; Gruber and Verboven, 2001; Comin *et al*., 2006; Czernich *et al*., 2011). Also, we find consistent inflexion points for both OtO and non-OtO flows for each threshold. Hence, we believe that the first-stage estimation is specified adequately.

In order to establish valid fitted values for the broadband penetration rate, we attempt to use purely exogenous instrumental variables. Therefore, we use voice-telephony and cable-TV subscribers per 100 inhabitants in 1997, the year before the first emergence of broadband in the country pairs at the same time. Even though the instruments are time invariant, this produces time-variant fitted values.

The first stage of the non-linear instrumental variable is estimated by Equation 10, with a non-linear least square. Columns (I), (II), and (III) in Table 3 present 148, 118, and 101 OtO country pairs, respectively; Table 4 presents 101, 92, and 76 non-OtO country pairs, respectively, for 1995-2009.

Table 3. OECD to OECD Flows: Diffusion Curve of the Instrumental Model's First Stage

Dependent variable: Broadband penetration rate ($BROAD_{ij,t}$)	(I)	(II)	(III)
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.274*** (0.006)	0.276*** (0.007)	0.277*** (0.008)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	0.334*** (0.018)	0.347*** (0.018)	0.302*** (0.017)
Diffusion speed (β)	0.917*** (0.025)	0.903*** (0.027)	0.890*** (0.028)
Inflexion point (τ)	2005.662*** (0.057)	2005.668*** (0.064)	2005.720*** (0.068)
Constant	0.003** (0.001)	-0.004*** (0.001)	-0.004** (0.001)
R^2	0.97	0.97	0.97
N	1981	1580	1342
F-test (p-values in parentheses)	121.90 (0.000)	99.41 (0.000)	88.10 (0.000)

(I), (II), (III) present the first-stage results of the diffusion curve for flows with 0.1, 0.3, and 0.5 thresholds, respectively. For each threshold, we control the first-stage model with more control variables, namely distance, real GDP, the wage, the unemployment rate, and the employment rate. The results are quite significant, but the coefficients are very small, so we do not present them. They are available upon request.

Table 4. Non-OECD to OECD Flows: Diffusion Curve of the Instrumental Model's First Stage

Dependent variable: Broadband penetration rate ($BROAD_{ij,t}$)	(I)	(II)	(III)
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.152***	0.154***	0.145***
	(0.020)	(0.021)	(0.024)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	0.107***	0.106***	0.105***
	(0.014)	(0.014)	(0.017)
Diffusion speed (β)	0.997***	0.995***	0.954***
	(0.104)	(0.106)	(0.113)
Inflexion point (τ)	2007.308***	2007.308***	2007.437***
	(0.271)	(0.277)	(0.343)
Constant	0.005***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)
R^2	0.84	0.85	0.83
N	1359	1233	1015
F-test (p-values in parentheses)	44.70	43.23	28.13
	(0.000)	(0.000)	(0.000)

(I), (II), (III) present the first-stage results of the diffusion curve for flows with 0.1, 0.3, and 0.5 thresholds, respectively. For each threshold, we control the first-stage model with more control variables, namely distance, real GDP, the wage, the unemployment rate, and the employment rate. The results are quite significant, but the coefficients are very small, so we do not present them. They are available upon request.

For OtO flows, Table 3 shows that the voice-telephony penetration rate, cable-TV penetration rate, diffusion speed, and inflexion point are quite significant in determining the broadband penetration rate. The inflexion point is estimated at around 2005 for OtO flows, and it does not vary much for different thresholds of flows.

For non-OtO flows, Table 4 also confirms the influence of the voice-telephony penetration rate, cable-TV penetration rate, diffusion speed, and inflexion point in determining the extent of broadband penetration. The inflexion point for non-OtO flows is estimated at 2007 and likewise does not vary much for different thresholds of flows. In view of the multiple aspects of technology adoption, it is reasonable to seek different inflexion points for OtO and non-OtO flows. Both voice-telephony penetration and cable-TV penetration appear to have positive and meaningful effects on the ceiling of the broadband penetration rate η_{ij}. The F-test of joint significance for voice telephony and cable TV suggests, according to the null hypothesis, that the estimated coefficients for both are different from zero at a 99% confidence interval.

4. Empirical Results

Based on the first stage of the diffusion curve, we calculate the predicted broadband penetration rate and plug this variable into Equation 5 from Sec-

tion 3. The second-stage results are shown in Tables 5 and 6 for OtO and non-OtO migration flows, respectively. In addition, we calculate the predicted years since broadband was introduced to the country pairs at the same time and insert this into Equation 5.

Models with odd numbers are at the second stage of the instrumental-variable model with OLS, whereas models with even numbers are at the same stage but with the country-pair fixed effect. To account for the fact that the broadband penetration rate is predicted by the first stage of the non-linear model, standard errors are bootstrapped (200 repetitions) in the second stage of the non-linear models. The broadband penetration rate appears to have a positive and significant effect on both OtO and non-OtO migration flows. The significance improves greatly in fixed-effect models. The coefficient of the broadband penetration rate is much higher for the non-OtO country pairs. This suggests that broadband connections between non-OECD and OECD countries affect migration flows from origin to host countries more than among OECD member states by improving the amount of positive information about the host; this, in turn, ends up inspiring others "back home" to also make the journey. This might be explained by the inflexion point's being around 2007 for non-OtO country pairs—approximately two years after the inflexion point for OtO country pairs. Broadband communication was seen to be more prominent between non-OECD and OECD members than among countries within the OECD between 1995 and 2009. Therefore, we can postulate that the broadband penetration rate has more sway over migration flows for non-OtO cases than for OtO ones.

Consistent with the gravity literature, distance and relative RGDP are found to be intimidating deterrents both for OtO and non-OtO migration flows for all thresholds. When it comes to wages in the host country, we observe a positive and significant relation to migration flows, as expected. It is only negative in OtO flows with 0.3 and 0.5 thresholds, and in non-OtO with 0.3 thresholds and second-stage OLS, but it is not significant. Unemployment in the origin country has a positive and important effect on migration flows for the fixed-effect models for OtO and non-OtO flows with all thresholds. To some extent, higher unemployment in the country of origin will impel individuals to seek a job elsewhere. This also confirms another finding: the employment rate in the host country is a decisive factor in facilitating migration flows in all the fixed-effect models for OtO and non-OtO migrations alike. In other words, individuals tend to move to where the employment prospects are better.

The dummy variable $FREE_{ij}$ is again found to be positive and significant in all cases. The value for the predicted years since the introduction of broad-

band turns out to be significant and negatively related to migration flows in the fixed-effect models. The coefficients of the predicted years since the coming of broadband appear much higher for the non-OtO country pairs. This reinforces the notion that the effect of the broadband penetration rate should be much higher for non-OtO country pairs. We also analyzed whether other telecommunications channels, such as mobile phones or fixed-landline phones, affect human movements between origin and host but found no strong correlation. Our results are available upon request.

4.1 Validity of Instruments

In order to determine whether our instruments—the voice-telephony and cable networks—might independently and directly affect migration flows or direct migration movements through channels other than broadband, we consider whether other communication technologies, such as mobile phones and the integrated-services digital network (ISDN—enabling voice and data transmission), might also affect migration flows.

In order to estimate the diffusion curves for mobile telephones and the ISDN, we apply the same ceiling, $\eta_{ij} = \eta_0 + \eta_1 TEL_{ij,1997} + \eta_2 CABLE_{ij,1997}$, based on the voice-telephony and the cable-TV penetration rates per 100 individuals for each flow-rate threshold, for both OtO and non-OtO flows. Then we follow the logistic curve ($\dfrac{\eta_{ij}}{1+e^{-[\beta(t-\tau)]}}$) for both mobile phones and the ISDN. The advent of broadband comes considerably later than that of voice telephony and cable TV. Since we measure the predicted broadband penetration rate according to these two variables in the year 1997—i.e., before broadband made its appearance in the country pairs sampled—it is safe to say our instruments are predetermined in terms of broadband diffusion. Yet, predetermination may be a necessary but insufficient condition for exogeneity in an econometric sense (Czernich *et al.*, 2011).

Thus, first of all, we analyze whether our instruments—TEL and CABLE—have an indirect effect on migration flows or affect migration flows through channels other than broadband. They not only bring about the deployment of the broadband network but also the diffusion of other technologies that may trigger migration flows. For that, we pick one of the most common communications tools—the mobile phone—whose adoption and diffusion started as far back as the 1980s (Kalba, 2008), and the oldest telecommunications invention—the ISDN—in use since the 1970s (https://www.nfon.com/gb/solutions/resources/glossary/isdn/).

Table 5. The Effect of the Broadband Penetration Rate on OtO Migration Flows: Second-Stage Results

Dependent variable: Log of migration flows	(1)	(2)	(3)	(4)	(5)	(6)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.007 (0.017)	0.048*** (0.012)	0.034** (0.017)	0.044*** (0.012)	0.044** (0.018)	0.045** (0.014)
Log of distance (log $DIST_{ij}$)	-0.540*** (0.046)		-0.367*** (0.047)		-0.172*** (0.048)	
Log of relative real GDP (log $RGDP_{ij,t}$)	-0.249*** (0.018)	-0.869*** (0.407)	-0.257*** (0.017)	-1.585*** (0.419)	-0.212*** (0.018)	-1.663*** (0.450)
Log of wage in the host country (log $wage_{j,t}$)	0.114** (0.037)	0.056** (0.024)	-0.033 (0.033)	0.046* (0.025)	-0.020 (0.031)	0.045* (0.025)
Unemployment rate in the origin ($Unempr_{i,t}$)	0.032 (0.009)	0.002** (0.009)	0.039 (0.009)	0.001*** (0.010)	0.034 (0.009)	0.002*** (0.010)
Employment rate in the host ($Empr_{j,t}$)	-0.011 (0.003)	0.024* (0.014)	-0.007 (0.003)	0.025* (0.013)	0.001 (0.003)	0.029** (0.014)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.614*** (0.088)	0.707*** (0.138)	0.349*** (0.092)	0.992*** (0.158)	0.450*** (0.094)	1.024*** (0.166)
Predicted years ($T^{\beta}_{ij,t}\_hat$)	0.061 (0.024)	-0.003* (0.015)	0.048 (0.023)	-0.006* (0.013)	0.030 (0.024)	-0.014* (0.014)
Constant	3.034*** (4.478)	-1.063 (0.983)	3.452*** (0.462)	-1.010 (0.883)	1.665 (0.478)	-1.143 (0.979)
R^2	0.17	0.27	0.15	0.37	0.12	0.36
N	2064	2064	1644	1644	1409	1409
Country pairs	148	148	118	118	100	100

Table 6. The Effect of the Broadband Penetration Rate on non-OtO Migration Flows: Second-stage Results

Dependent variable: Log of migration flows	(1)	(2)	(3)	(4)	(5)	(6)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.078*** (0.012)	0.103*** (0.021)	0.089*** (0.012)	0.101*** (0.023)	0.072*** (0.012)	0.109** (0.030)
Log of distance (log $DIST_{ij}$)	-0.071 (0.066)		-0.179** (0.063)		-0.466*** (0.054)	
Log of relative real GDP (log $RGDP_{ij,t}$)	-0.287*** (0.021)	-0.923*** (0.371)	-0.249*** (0.021)	-0.950** (0.382)	-0.196*** (0.019)	-0.928** (0.440)
Log of wage in the host country (log $wage_{j,t}$)	0.080** (0.041)	0.062** (0.037)	0.053 (0.041)	0.082** (0.036)	0.200*** (0.038)	0.089** (0.037)
Unemployment rate in the origin ($Unempr_{i,t}$)	-0.062 (0.007)	0.016** (0.013)	-0.058 (0.007)	0.015* (0.014)	-0.060 (0.006)	0.013* (0.015)
Employment rate in the host ($Empr_{j,t}$)	0.030** (0.003)	0.039** (0.002)	0.022** (0.003)	0.042* (0.023)	0.022 (0.003)	0.049* (0.033)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.062 (0.299)	0.709*** (0.153)	0.158 (0.298)	0.725*** (0.161)	0.961*** (0.264)	0.739*** (0.199)
Predicted years ($T^{\beta}_{ij,t}\_hat$)	0.030 (0.073)	-0.025* (0.048)	-0.088 (0.072)	-0.032* (0.050)	-0.219 (0.081)	-0.062* (0.061)
Constant	3.289*** (0.609)	-3.470** (1.695)	4.152*** (0.562)	-3.607 (1.747)	5.475*** (0.496)	-3.732 (2.398)
R^2	0.20	0.34	0.19	0.36	0.28	0.36
N	1397	1397	1277	1277	1049	1049
Country pairs	101	101	92	92	76	76

Models (1)-(3)-(5) and Models (2)-(4)-(6) of Table 5 and Table 6 present the second stages of the instrumental variable with country-pair and time-fixed effect, respectively. Models (1)-(2), Models (3)-(4), and Models (5)-(6) are for the 0.1, 0.3, and 0.5 rate thresholds for the OtO and non-OtO migration flows, respectively. Bootstrapped standard errors are in parentheses.

To test our claim, we estimate diffusion curves with the same ceiling (see Equation 9) for MOB and ISDN. The related results are in Tables 13-18 in Appendix C; clearly, no significant effect has been found. Thus, we find no evidence of penetration of the traditional networks—TEL and CABLE—on the diffusion of MOB and ISDN. We conclude that these instruments only determine broadband diffusion and not that of other potential telecommunications modalities that might have an impact on migration flows, thus underlining the validity of our instruments.

TEL and CABLE could also have a direct impact on migration flows, which we test by inserting them into the same model as was used for broadband—but to no avail (see Tables 19 and 20 in Appendix D). As is seen in these tables, we observe no noticeable effect of voice telephony and cable TV on either of the alternative communications channels—mobile and ISDN—at a conventional level. This confirms the validity of our instruments. Here, we obtained information from the ITU's ICT database on both mobile-telephone subscribers per 100 inhabitants and ISDN subscribers per 100 inhabitants. The F-test of joint significance for voice telephony and cable TV suggests that, based on the null hypothesis, the estimated coefficients for both are different from zero at a 99% confidence interval.

4.2 Robustness Checks

Our first-stage results are based on the voice-telephony penetration rate and the cable-TV penetration rate per 100 inhabitants in the population. This is done to arrive at the predicted broadband penetration rate per 100 inhabitants in the population. However, such a measurement may lead to a correlation in the first-stage result, as both the endogenous and instrumental variables have a common denominator. Thus, we estimate the first-stage diffusion curve with the voice-telephony penetration rate per 100 inhabitants and the cable-TV penetration rate per 100 inhabitants to determine the broadband penetration rate at household level ($BROADHH_{ij}$), as in Table 7 for OtO migration flows with 0.1, 0.3, and 0.5 thresholds and Table 8 for non-OtO migration flows with 0.1, 0.3, and 0.5 rate thresholds.

The levels of both instruments—the voice-telephony penetration rate per 100 inhabitants and the cable-TV penetration rate per 100 inhabitants—remain positive and significant for both OtO and non-OtO cases. In fact, the coefficients are much higher, suggesting that both instrumental variables determine broadband penetration to be higher if measured at the household level. The inflexion point remains around 2005 for OtO flows, 2007 for non-OtO flows.

Table 7. Diffusion Curve: First Stage of the Instrumental Variables for OtO Flows

Dependent variable: $BROADHH_{ij}$	(1)	(2)	(3)
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	1.251*** (0.047)	1.236*** (0.052)	1.221*** (0.056)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	0.926*** (0.144)	1.059*** (0.143)	0.835*** (0.184)
Diffusion speed (β)	0.905*** (0.030)	0.893*** (0.033)	0.891*** (0.035)
Inflexion point (τ)	2005.783*** (0.070)	2005.785*** (0.080)	2005.840*** (0.087)
Constant	0.084*** (0.008)	0.081*** (0.000)	0.088*** (0.009)
R^2	0.96	0.96	0.96
N	1981	1580	1342
F-test (p-values in parentheses)	459.54 (0.000)	375.74 (0.000)	312.76 (0.000)

$BROADHH_{ij}$ is measured as the multiplication of broadband subscribers per household in the population in origin and host.

Table 8. Diffusion Curve: First Stage of the Instrumental Variables for Non-OtO Flows

Dependent variable: $BROADHH_{ij}$	(1)	(2)	(3)
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.709*** (0.141)	0.662*** (0.113)	0.006*** (0.002)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	0.708*** (0.265)	0.684*** (0.154)	0.671*** (0.100)
Diffusion speed (β)	0.961*** (0.103)	0.962*** (0.106)	0.918*** (0.112)
Inflexion point (τ)	2007.347*** (0.298)	2007.348*** (0.306)	2007.477*** (0.381)
Constant	0.065*** (0.010)	0.063*** (0.010)	0.069*** (0.012)
R^2	0.80	0.80	0.78
N	1359	0.85	1015
F-test (p-values in parentheses)	35.26 (0.000)	34.10 (0.000)	22.82 (0.000)

$BROADHH_{ij}$ is defined above in Table 7.

Following the first-stage results based on the household level of broadband subscription, the second stage of the estimation results is presented in Table 9 for OtO flows with 0.1, 0.3, and 0.5 rate thresholds, and in Table 10 for non-OtO flows with 0.1, 0.3, and 0.5 rate thresholds. As can be seen in both tables, the significance and the sign of the coefficients remain the same. The pattern of how coefficients change across different thresholds also remains the same. The F-test of joint significance for voice telephony and cable TV suggests that, based on the null hypothesis, the estimated coefficients for both are different from zero at a 99% confidence interval, for both OtO and non-OtO country pairs.

Table 9. Second Stage of the Instrumental Variables Model for OtO Flows

Dependent variable: Log of migration flows	(1)	(2)	(3)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.052 (0.018)	0.056** (0.017)	0.049** (0.018)
Log of distance ($\log DIST_{ij}$)	-0.543*** (0.047)	-0.371*** (0.047)	-0.175*** (0.049)
Log of relative real GDP ($\log RGDP_{ij,t}$)	-0.251*** (0.018)	-0.257*** (0.017)	-0.212*** (0.018)
Log of wage in the host country ($\log wage_{j,t}$)	0.098** (0.037)	-0.043 (0.033)	-0.024 (0.031)
Unemployment rate in the origin ($Unempr_{i,t}$)	0.028** (0.009)	0.037*** (0.009)	0.034*** (0.009)
Employment rate in the host ($Empr_{j,t}$)	-0.009 (0.003)	-0.006 (0.003)	0.002 (0.003)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.634*** (0.087)	0.353*** (0.093)	0.451*** (0.095)
Predicted years ($T_{ij,t}^{\beta}\_hat$)	-0.033 (0.023)	0.004 (0.021)	0.019 (0.022)
Constant	3.392 (0.476)	3.587*** (0.455)	1.628** (0.470)
R^2	0.16	0.15	0.12
N	2064	1644	1409

(I), (II), (III) present the OLS estimation of the second-stage results of instrumental variables for OtO flows with 0.1, 0.3 ,and 0.5 rate thresholds, respectively. We also obtained a fixed-effect estimation of the second-stage results but do not present it here, as the time-invariant variable is dropped from the model. The sign and significance of the coefficients remain the same in the fixed-effect model. They are available upon request.

Table 10. Second Stage of the Instrumental Variables Model for Non-OtO Flows

Dependent variable: Log of migration flows	(1)	(2)	(3)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.082*** (0.013)	0.094** (0.013)	0.077*** (0.012)
Log of distance ($\log DIST_{ij}$)	-0.080 (0.066)	-0.187** (0.062)	-0.452*** (0.054)
Log of relative real GDP ($\log RGDP_{ij,t}$)	-0.286*** (0.021)	-0.247*** (0.021)	-0.195*** (0.019)
Log of wage in the host country ($\log wage_{j,t}$)	0.078* (0.041)	0.049 (0.041)	0.196* (0.038)
Unemployment rate in the origin ($Unempr_{i,t}$)	-0.062 (0.007)	-0.058 (0.007)	-0.060 (0.006)
Employment rate in the host ($Empr_{j,t}$)	0.029 (0.003)	0.022 (0.003)	0.022 (0.003)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.064 (0.230)	0.159 (0.298)	0.961*** (0.264)
Predicted years ($T_{ij,t}^{\beta}\_hat$)	0.032 (0.073)	-0.090 (0.071)	-0.221** (0.081)
Constant	3.208*** (0.606)	4.080*** (0.558)	5.414*** (0.491)
R^2	0.20	0.20	0.28
N	1397	1277	1015

(I), (II), (III) present the OLS estimation of the second-stage results of instrumental variables for non-OtO flows with 0.1, 0.3, and 0.5 rate thresholds, respectively. We also obtained a fixed-effect estimation of the second-stage results but do not present it here, as the time-invariant variable is dropped from the model. The sign and significance of the coefficients remain the same in the fixed-effect model. They are available upon request.

Additional robustness checks are listed in Tables 19-20 in Appendix D. One can argue that, apart from broadband, phone traffic between the origin and host countries might have an effect on migration flows. In order to check this, we control the second-stage results with an extra variable of phone traffic between origin and host, and we calculate this variable:

$$phntraffic_{ij} = phntraffic_i \times phntraffic_j \qquad (11)$$

Where $phntraffic_i$ stands for international incoming phone traffic to the origin, and $phntraffic_j$ is international outgoing phone traffic from the host country. This variable will give the approximate international phone traffic between country i and country j at time t. Tables 21-22 in Appendix E present the results for OtO and non-OtO countries with 0.1, 0.3, and 0.5 rate thresholds under Models (I), (II), and (III), respectively. Indeed, phone traffic within country pairs has a positive and significant effect on OtO migration flows, whereas there is little evidence that this holds true for non-OtO flows. All in all, the broadband penetration rate is still positive and significant; the sign of the remainder of the control variables also remains the same.

We apply additional robustness checks and see that the broadband penetration rate holds positive as a significant determinant of migration. These tests are available upon request.

5. Conclusion

Our non-linear instrumental approach to broadband penetration rates found a positive and strong effect on migration flows. This effect appears to be even stronger for non-OtO flows in comparison to OtO flows.

Our results are robust to a number of different specifications. For instance, measuring broadband penetration at the household level while keeping our instrumental variables—voice telephony and cable TV penetration—at the per-100-inhabitant level did not affect the second-stage results as far as the sign of the coefficients or the significance went; in fact, the significance improved. Additionally, we checked whether landline-phone traffic between country pairs or international calling-in or calling-out phone traffic also had a similar effect to broadband, controlling for them in all the models. The broadband penetration rate remains the main determinant of migration decisions, while the sign of the other variables does not change at all for all three thresholds.

The effect of broadband penetration is higher in non-OtO migration flows. This may be so not only for information-exchange reasons but also for job

applications and interviews, which are more likely to take place online; job-related travel, on the other hand, can be undertaken more easily between geographically closer countries. In other words, migrants in non-OtO flows make more use of broadband to ensure a place to work or stay, while those in OtO flows can interact with contacts in the host country not only through broadband but also in person.

We had different thresholds, namely 0.1, 0.3, and 0.5 rates (10, 30, and 50 per 1,000 population), as we wanted to capture the relationship between the broadband penetration rate and migration flows at various levels. The lowest rate we focused on was 0.1 (10 per 1,000), due to our belief that the flows should be at a countable level if we were to analyze the effect of broadband penetration on migration flows. To give even more accountability, we chose the other thresholds as 0.3 and 0.5. The results for each threshold, particularly 0.3 and 0.5, were quite similar, and they were all consistent. The results improved above the larger (that is, the 0.5) constraint. We believed a higher frequency—while capturing fewer country pairs—would produce more accurate results. Moreover, we argue that a group of flows whose threshold is 0.1 can capture more country pairs but may yield less accurate results, since the 0.1 threshold will pick up country pairs in which even a single migrant will be treated as a migration flow: this segment surely does not justify an investigation into the relationship between migration and broadband penetration.

The different thresholds for OtO flows gave consistent results with one another, with the results improving from the 0.1 to the 0.5 rate thresholds. This was the same for non-OtO flows, where the significance of the right-hand-side variables went from the 0.1 to the 0.5 rate threshold. We found the inflexion points for OtO and non-OtO flows as 2005 and 2007, respectively. The possible explanation for this may lie in the way more developed countries (OECD ones) adopt technology versus their developing or undeveloped counterparts (non-OECD ones). The inflexion point of 2007 for non-OECD countries suggests that they adopt technology and reach saturation point approximately two years later.

What is more, having no legal restriction was always found to be positively and significantly correlated with migration flows, both OtO and non-OtO; this relationship was stronger for the latter. In this regard, if we consider legal restrictions as a migration cost, people comprising the flows from more distant countries will take these barriers more into account before setting out. That is also consistent with the result for distance, which was consistent with the gravity models across the literature (as one of the essential demotivating factors in deciding where to move).

Overall, we found that the broadband penetration rate had a significant and positive effect on migration flows. This effect was stronger for non-OtO migration flows. Broadband appeared to be preferred over landline phones by potential migrants between 1995 and 2009. Further research is needed to investigate whether the new and more sophisticated smart phones stimulate migration flows, which we believe to be true: they also provide cheaper and easier communications to individuals overseas, and so may be preferred by those contemplating emigrating. However, we were unable to investigate the existence of such an effect due to lack of data. The ITU's ICT indicators consist of only a few years of records of smart-phone subscriptions, but more data will become available in the foreseeable future, enabling other researchers to delve into this area for more detail.

APPENDIX A

Figure 1. Actual and Predicted Broadband Penetration Rates for Country Pairs, OtO Flows at a 0.1 Rate (10 per 1,000)
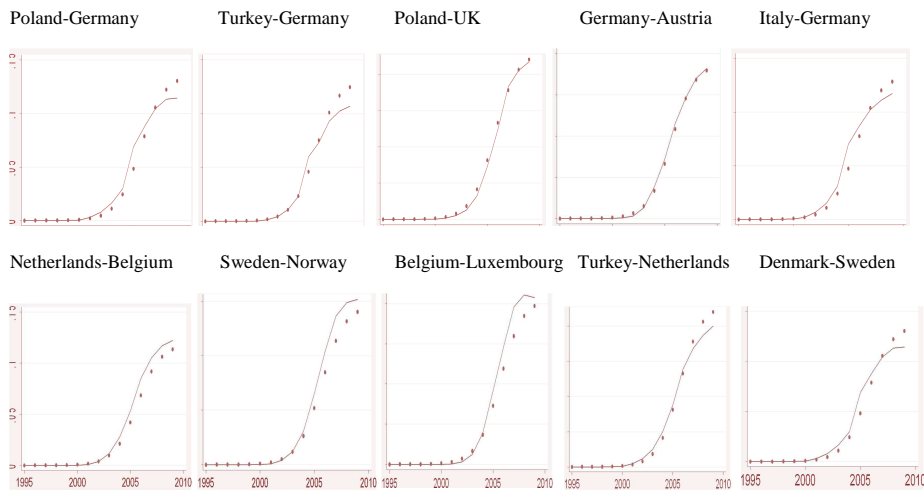
Figure 2. Actual and Predicted Penetration Rates for Country Pairs, OtO Flows at a 0.3 Rate (30 per 1,000)

Poland-Germany   Turkey-Germany   Poland-UK   Germany-Austria   Italy-Germany

Netherlands-Belgium   Sweden-Norway   Belgium-Luxembourg   Turkey-Netherlands   Denmark-Sweden

Figure 3. Actual and Predicted Broadband Penetration Rates for Country Pairs, OtO Flows at a 0.5 Rate (50 per 1,000)

Poland-Germany   Turkey-Germany   Poland-UK   Germany-Austria   Italy-Germany

Netherlands-Belgium   Sweden-Norway   Belgium-Luxembourg   Turkey-Netherlands   Denmark-Sweden

Figure 4. Actual and Predicted Broadband Penetration Rates for Country Pairs, Non-OtO Flows at a 0.1 Rate (10 per 1,000)

Algeria-France   Russia-Germany   Bosnia -Austria   Bulgaria-Spain   China-Spain

Ukraine-Germany   Morocco-France   Morocco-Spain   Romania-Germany   Romania-Spain

Figure 5. Actual and Predicted Broadband Penetration Rates for Country Pairs, Non-OtO Flows at a 0.3 Rate (30 per 1,000)

Algeria-France   Russia-Germany   Bosnia -Austria   Bulgaria-Spain   China-Spain

Ukraine-Germany   Morocco-France   Morocco-Spain   Romania-Germany   Romania-Spain
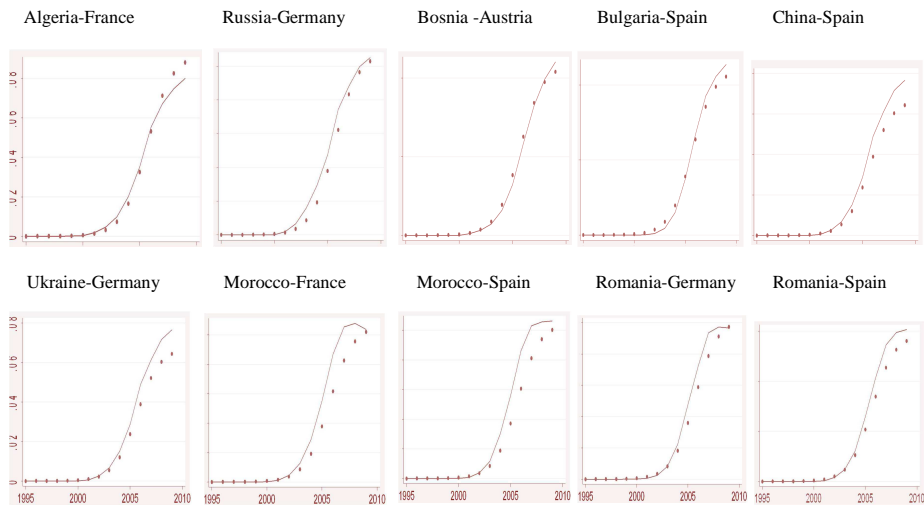
Figure 6. Actual and Predicted Broadband Penetration Rates for Country Pairs, Non-OtO Flows at a 0.5 Rate (50 per 1,000)
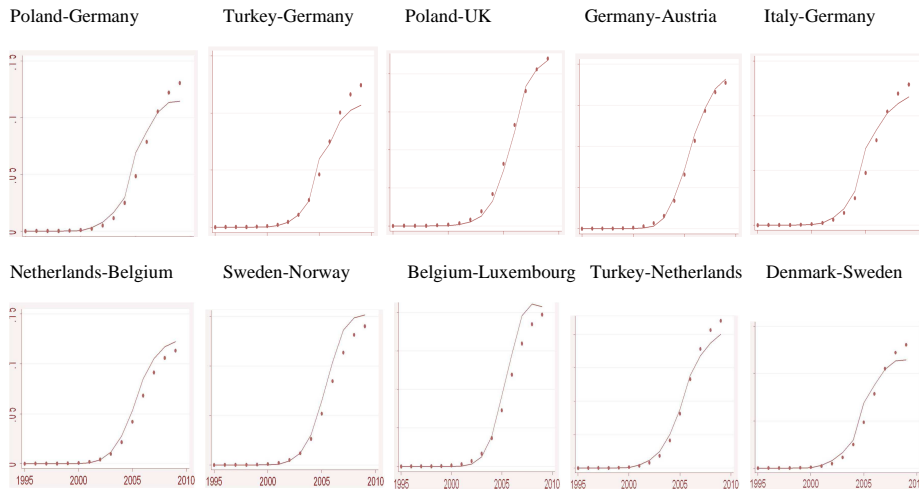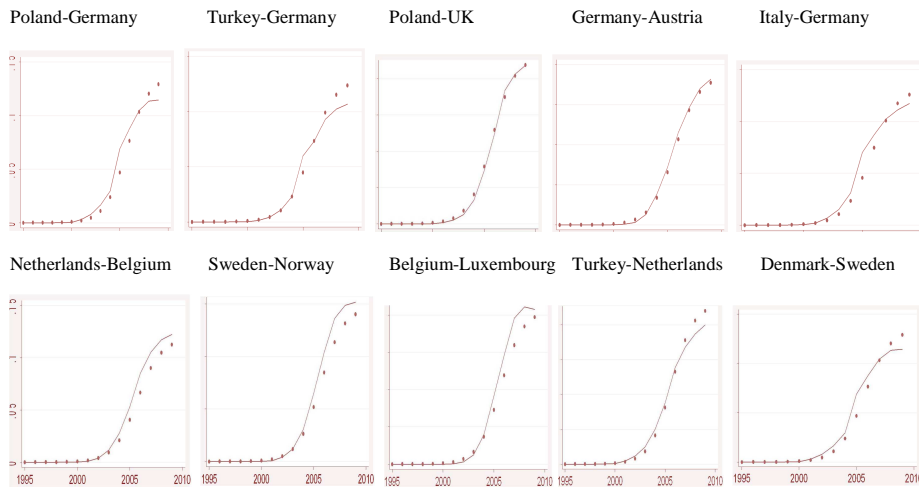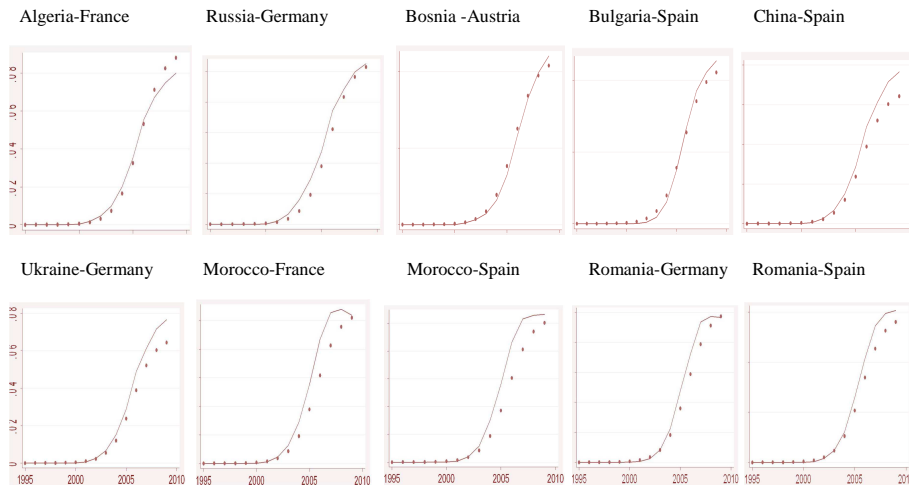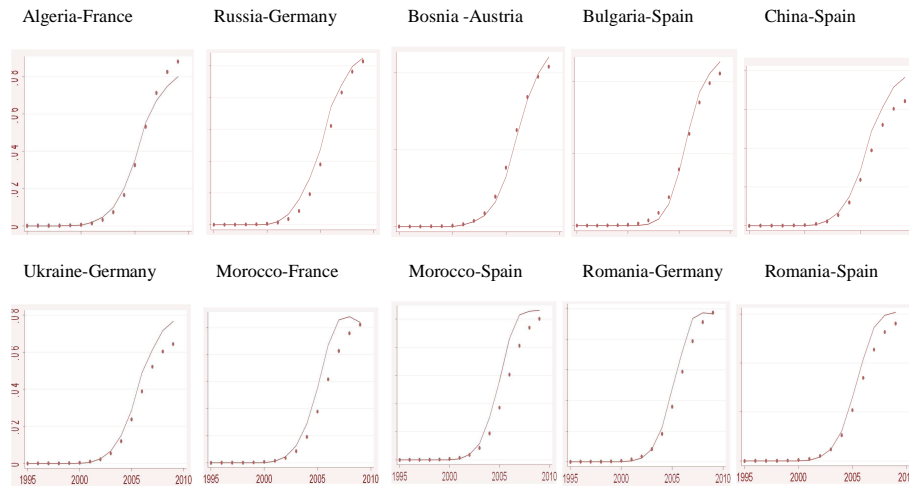

APPENDIX B

Table 11. Descriptive Statistics for OtO Country Pairs

Variable	Obs	Mean	Std. Dev.	Min	Max
Flowsij	2067	4.058166	10.9581	0	151.743
Unempri	2220	8.878677	3.949635	2.513	22.9
Emprj	2220	68.60214	9.911995	27.6	81.8
Freeij	2220	.740991	.4381893	0	1
Broadijt	2220	.0176976	.027628	8.89e-07	.1304825
Distij	2220	1162.671	686.4299	160.9283	3027.229
Rgdpij	2220	5.193729	11.65273	.0029073	104.3875
Awagej	2220	2524.594	3036.444	.9440161	27641

Table 12. Descriptive Statistics for Non-OtO Country Pairs

Variable	Obs	Mean	Std. Dev.	Min	Max
Flowsij	1401	5.683184	14.66967	0	261.273
Unempri	1515	11.56115	7.882959	2.9	38.4
Emprj	1515	65.39724	12.90079	27.6	81.8
Freeij	1515	.0356436	.1854611	0	1
Broadijt	1515	.0026988	.0058787	2.35e-08	.0504853
Distij	1515	3283.739	2426.287	485.1447	9592.113
Rgdpij	1515	1.711511	6.159809	.0008763	86.71633
Awagej	1515	2456.605	3249.689	.9440161	27641

APPENDIX C

Table 13. Diffusion Curve for First Stage of Instrumental Variable Model: OtO Flows at a 0.1 Rate (10 per 1,000)

	Dependent variable: MOB_{ij}	Dependent variable: $ISDN_{ij}$
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.235* (0.122)	0.032* (0.002)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	-0.534 (0.326)	0.010 (0.008)
Diffusion speed (β)	0.403** (0.195)	0.117*** (0.010)
Inflexion point (τ)	2003.572*** (2.845)	1995.204*** (0.232)
Constant	-0.132 (0.780)	6.087*** (0.221)
R^2	0.11	0.19
N	2078	1794
F-test (p-values in parentheses)	122.12 (0.000)	117.83 (0.000)

Table 14. Diffusion Curve for First Stage of Instrumental Variable Model: OtO flows at a 0.3 Rate (30 per 1,000)

	Dependent variable: MOB_{ij}	Dependent variable: $ISDN_{ij}$
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.265* (0.149)	0.034* (0.002)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	-0.627 (0.401)	0.004 (0.008)
Diffusion speed (β)	0.415* (0.238)	0.122*** (0.010)
Inflexion point (τ)	2003.440*** (3.172)	1995.082*** (0.231)
Constant	-0.403 (0.914)	5.917*** (0.215)
R^2	0.11	0.19
N	1475	1275
F-test (p-values in parentheses)	99.16 (0.000)	98.12 (0.000)

Table 15. Diffusion Curve for First Stage of Instrumental Variable Model: OtO Flows at a 0.5 Rate (50 per 1,000)

	Dependent variable: MOB_{ij}	Dependent variable: $ISDN_{ij}$
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.069 (0.036)	0.033* (0.003)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	-0.183 (0.086)	0.015 (0.010)
Diffusion speed (β)	0.396* (0.104)	0.117*** (0.012)
Inflexion point (τ)	2003.343*** (1.745)	1995.064*** (0.280)
Constant	2.008* (0.734)	5.999*** (0.262)
R^2	0.30	0.19
N	1177	1014
F-test (p-values in parentheses)	91.08 (0.000)	87.11 (0.000)

In Tables13-15, MOB_{ij} is calculated as $MOB_i \times MOB_j$ where MOB_i is the mobile-phone subscribers per 100 inhabitants in the origin and MOB_j is the mobile-phone subscribers per 100 inhabitants in the host. $ISDN_{ij}$ is calculated as $ISDN_i \times ISDN_j$ where $ISDN_i$ is the integrated-services digital network subscribers per 100 in the origin and $ISDN_j$ is the integrated-services digital network subscribers per 100 in the host.

Table 16. Diffusion Curve for First Stage of Instrumental Variable Model: Non-OtO Flows at a 0.1 rate (10 per 1,000)

	Dependent variable MOB_{ij}	Dependent variable: $ISDN_{ij}$
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.191*(0.074)	0.000 (0.011)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	-0.353*(0.167)	0.125* (0.055)
Diffusion speed (β)	0.785**(0.296)	-9.193 (5.081)
Inflexion point (τ)	2005.563***(0.980)	2008.178*** (9.872)
Constant	0.815**(0.239)	6.419*** (0.065)
R^2	0.29	0.14
N	1425	1163
F-test (p-values in parentheses)	7.33 (0.000)	6.11 (0.000)

Table 17. Diffusion Curve for First Stage of Instrumental Variable Model: Non-OtO Flows at a 0.3 Rate (30 per 1,000)

	Dependent variable: MOB_{ij}	Dependent variable: $ISDN_{ij}$
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.201* (0.082)	0.000 (0.010)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	-0.300 (0.170)	0.072 (0.055)
Diffusion speed (β)	0.789**(0.336)	-7.866 (4.708)
Inflexion point (τ)	2005.558***(1.098)	2008.355*** (21.283)
Constant	0.635**(0.203)	6.112***(0.066)
R^2	0.29	0.15
N	1275	1047
F-test (p-values in parentheses)	6.15 (0.000)	5.39 (0.000)

Table 18. Diffusion Curve for First Stage of Instrumental Variable Model: Non-OtO Flows at a 0.5 Rate (50 per 1,000)

	Dependent variable: MOB_{ij}	Dependent variable: $ISDN_{ij}$
Voice-telephony penetration rate ($VOICE_{ij,1997}$)	0.247 (0.108)	0.008 (0.012)
Cable-TV penetration rate ($CABLE_{ij,1997}$)	-0.320 (0.195)	0.233 (0.062)
Diffusion speed (β)	0.836* (0.446)	-7.791 (7.523)
Inflexion point (τ)	2005.527*** (1.243)	2008.398*** (38.495)
Constant	0.373** (0.185)	5.351*** (0.075)
R^2	0.28	0.15
N	1035	855
F-test (p-values in parentheses)	5.12 (0.000)	4.27 (0.000)

In Tables16-18, MOB_{ij} is calculated as $MOB_i \times MOB_j$ where MOB_i is the mobile-phone sub-scribers per 100 inhabitants in the origin and MOB_j is the mobile-phone subscribers per 100 inhabitants in the host. $ISDN_{ij}$ is calculated as $ISDN_i \times ISDN_j$ where $ISDN_i$ is the integrated-services digital network subscribers per 100 in the origin and $ISDN_j$ is the integrated-services digital network subscribers per 100 in the host.

APPENDIX D

Table 19. Additional Robustness Checks for OtO Flows

Dependent variable: Log of migration flows	(1)	(2)	(3)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.0447*** (0.0130)	0.0359*** (0.0124)	0.0370*** (0.0138)
Log of distance ($\log DIST_{ij}$)	-0.689*** (0.208)	-0.744*** (0.222)	-0.489** (0.224)
Log of relative real GDP ($\log RGDP_{ij,t}$)	-0.327*** (0.0742)	-0.439*** (0.0734)	-0.390*** (0.0778)
Log of wage in the host country ($\log wage_{j,t}$)	0.0442* (0.0254)	0.0342 (0.0232)	0.0323 (0.0253)
Unemployment rate in the origin ($Unempr_{i,t}$)	0.003 (0.00964)	0.00517 (0.00949)	0.00712 (0.0112)
Employment rate in the host ($Empr_{j,t}$)	-0.0193 (0.0128)	0.0224** (0.0111)	0.0273** (0.0119)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.675*** (0.148)	0.912*** (0.151)	0.929*** (0.177)
Predicted years ($T_{ij,t}^{\beta}\_hat$)	0.009 (0.017)	0.007 (0.015)	-0.002 (0.016)
TEL_{ij}	0.577 (0.581)	0.836 (0.587)	0.650 (0.707)
$CABLE_{ij}$	-0.748 (0.522)	-1.665 (0.541)	-1.354* (0.692)
Constant	3.697** (1.605)	4.042** (1.601)	2.136 (1.560)
R^2	0.26	0.34	0.34
Country pairs	148	118	100

Table 20. Additional Robustness Checks for Non-OtO Flows

Dependent variable: Log of migration flows	(1)	(2)	(3)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.086*** (0.016)	0.086*** (0.015)	0.091*** (0.018)
Log of distance ($\log DIST_{ij}$)	-0.073 (0.29)	-0.172 (0.252)	-0.395* (0.240)
Log of relative real GDP ($\log RGDP_{ij,t}$)	-0.312*** (0.100)	-0.260*** (0.094)	-0.183** (0.092)
Log of wage in the host country ($\log wage_{j,t}$)	0.071* (0.043)	0.089** (0.037)	0.100*** (0.036)
Unemployment rate in the origin ($Unempr_{i,t}$)	0.002 (0.012)	0.001 (0.013)	0.005 (0.014)
Employment rate in the host ($Empr_{j,t}$)	0.015 (0.017)	0.018 (0.016)	0.012 (0.017)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.785*** (0.157)	0.807*** (0.163)	0.847*** (0.209)
Predicted years ($T_{ij,t}^{\beta}\_hat$)	-0.052 (0.0526)	-0.065 (0.0496)	-0.096 (0.065)
TEL_{ij}	-0.578 (0.395)	-0.874* (0.392)	-0.768* (0.395)
$CABLE_{ij}$	0.195 (0.279)	0.498 (0.242)	0.274 (0.257)
Constant	-1.233 (2.500)	0.941 (2.293)	3.540* (2.029)
R^2	0.32	0.35	0.33
Country pairs	101	92	76

APPENDIX E

Table 21. Robustness Check with Additional Control Variables: OtO for 0.1, 0.3, 0.5 Rate Flows

Dependent variable: Log of migration flows	(1)	(2)	(3)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.022*(0.016)	0.026*(0.016)	0.038**(0.017)
Log of distance ($\log DIST_{ij}$)	-0.745**(0.045)	-0.528**(0.045)	-0.329**(0.047)
Log of relative real GDP ($\log RGDP_{ij,t}$)	-0.694**(0.024)	-0.605**(0.027)	-0.529**(0.028)
Log of wage in the host country ($\log wage_{j,t}$)	0.001*(0.000)	0.002*(0.000)	0.002*(0.000)
Unemployment rate in the origin ($Unempr_{i,t}$)	0.058*(0.008)	0.056*(0.009)	0.053*(0.009)
Employment rate in the host ($Empr_{j,t}$)	0.007**(0.003)	0.004 (0.003)	0.011(0.003)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.039(0.090)	-0.085 (0.096)	0.062 (0.096)
Predicted years ($T_{ij,t}^{\beta}\_hat$)	0.066*(0.023)	0.060 (0.022)	0.046 (0.023)
$\log\_phntraffic_{ij}$	0.872*(0.034)	0.659*(0.037)	0.587*(0.037)
Constant	-	-	-
R^2	0.35	0.29	0.25
N	1906	1517	1300
Country pairs	148	118	100

Models (I), (II), (III) present the results for OtO flows with 0.1, 0.3, and 0.5 rate thresholds, respectively. Here, $\log\_phntraffic_{ij}$ is calculated as international incoming fixed-telephone traffic $\log\_trafficin_i$ in the origin times international outgoing fixed-telephone traffic $\log\_trafficout_j$ in the host in minutes, respectively.

Table 22. Robustness Check with Additional Control Variables: non-OtO for 0.1, 0.3, 0.5 Rate Flows

Dependent variable: Log of migration flows	(1)	(2)	(3)
Predicted penetration rate ($BROAD_{ij,t}\_hat$)	0.077***(0.013)	0.087***(0.013)	0.106***(0.013)
Log of distance ($\log DIST_{ij}$)	-0.125*(0.070)	-0.237**(0.065)	-0.429**(0.058)
Log of relative real GDP ($\log RGDP_{ij,t}$)	-0.556**(0.033)	-0.491**(0.034)	-0.380**(0.031)
Log of wage in the host country ($\log wage_{j,t}$)	0.010 (0.007)	0.011*(0.006)	0.011*(0.008)
Unemployment rate in the origin ($Unempr_{i,t}$)	-0.053 (0.007)	-0.051(0.007)	-0.052 (0.007)
Employment rate in the host ($Empr_{j,t}$)	-0.023(0.003)	-0.016 (0.003)	-0.015 (0.003)
Dummy = 1 if no restriction ($FREE_{ij,t}$)	0.162 (0.297)	0.246 (0.295)	0.793*(0.273)
Predicted years ($T_{ij,t}^{\beta}\_hat$)	0.039 (0.081)	-0.076 (0.080)	-0.191*(0.086)
$\log\_phntraffic_{ij}$	0.670 (0.070)	0.623 (0.069)	0.429*(0.062)
Constant	-	-	-2.155 (1.364)
R^2	0.30	0.28	0.33
N	1243	1132	923
Country pairs	101	92	76

Models (I), (II), (III) present the results for non-OtO flows with 0.1, 0.3, and 0.5 rate thresholds, respectively. Here, $\log\_phntraffic_{ij}$ is calculated as international incoming fixed-telephone traffic $\log\_trafficin_i$ in the origin multiplied by international outgoing fixed-telephone traffic $\log\_trafficout_j$ in the host in minutes, respectively.

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