

## CHAPTER 7

### Big postal data, nowcasting and the global pulse of the economy

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#### 1. Introduction

The first two chapters of this book made use of only a very small portion of the data consolidated at the UPU. From 1 January 2012 until 30 June 2013, more than 2.7 billion events were recorded through the POST\*Net information technology infrastructure. The UPU and the international postal community could further leverage the billions of data points available. This chapter seeks to open a new perspective on how this information could contribute to the successful transformation of the postal sector, and to show its relevance in today's global economy.

“Big data” is a generic term that represents another way of collecting data and statistics. Unlike traditional statistics derived from well-defined and structured questionnaires, big data covers the electronic collection of unstructured bits of information from various sources, such as sensors, electronic platforms, track-and-trace systems, posts on social networks and even satellite images. According to recent estimations, 90% of the data in the world was created in the past two years alone. The UN's Global Pulse (2012) elaborates: “In our digital age, a growing ocean of data is now available. Most of this data is being generated at almost no cost, in real time, merely as a by-product of people and businesses going about their daily lives and transactions.”

While traditional statistics can collect data only on a limited number of variables and rarely exceed the gigabytes dimension, the real-time aspect of big data generates terabytes and even petabytes of data. The challenge is then to take this unstructured information and structure it for purposes other than those for which the data was initially collected. Only then can meaningful correlations for business or policy purposes be identified and monitored over time. A close and real-time monitoring of

these huge databases is a necessity for both businesses and governments today when designing new services or establishing new policies. The same holds true for postal sector stakeholders.

Indeed, Posts are facing turbulent times related not only to long-run structural changes, as described in chapter 1, but also to shorter-run ones. As for many other businesses, the 21st century is for Posts one of uncertainty, volatility and rapid evolutions spurred by increased connectivity. The acceleration of electronic substitution of traditional mail, the rise of new communication media and the rapid transformation of postal traffic towards the delivery of goods in response to the surge of e-commerce are leading many operators and governments to rethink the role of the postal infrastructure. Besides e-commerce, opportunities are also arising in the provision of financial and payment services, often in response to recent pro-active trade facilitation and financial inclusion policies (see chapter 6). Never before has the quick integration of good data and analysis, i.e. data analytics, been so absolutely critical for timely decision making at both the business and government level.

Many private companies, including major customers of the Post (e.g. eBay), are already finding ways to use powerful computing and data mining techniques to analyze this new data, so as to better understand customers, identify emerging market trends and inform decision makers with key insights about their markets. From a policy perspective, big data holds enormous promise for improving our understanding of how populations are impacted by regional and global shocks. It will allow development practitioners to monitor their programmes and policies in real time to strengthen long-term development outcomes.

So where is this big postal data? Posts are major big data generators. Postal operators and their transportation partners collect huge amounts of real-time data through their operating and track-and-trace systems, which log the geography, time and conditions of all sorts of exchanges, at national or international level. Posts “datify” the lives of millions of people and businesses in each country in the same way Google is able to generate data on all aspects of life through our searches. For instance, it can release flu alerts simply by monitoring the number of people searching for the word “flu”. Similarly, “Twitter datifies stray thoughts”, and “LinkedIn datifies professional networks” (Cukier and Mayer-Schoenberger, 2013).

Nevertheless, while Google, Twitter and LinkedIn take advantage of big data to continuously innovate and adapt their products and services, Posts leverage only a small proportion of the huge amounts of data and information they handle. This chapter provides an example of one of the potential uses of big postal data and the power of analyzing real-time international postal data for macroeconomic nowcasting. We then go on to highlight the benefits of using big data for sector-specific issues.

## 2. Big postal data and macroeconomic nowcasting

“Postal economics might be more central to understanding the economy than monetary economics,” wrote Edward Prescott, Nobel laureate in economic sciences, in a private correspondence with other economists in the early 1980s. Could the same hold true for measuring the pulse of the global economy in the 21st century, in spite of the rise in e-mail and the Internet? The first chapter pointed to an increasing decoupling of economic growth and domestic letter-post traffic growth. However, the story does not seem to be the same with respect to the relationship between the global economy and international letter-post exchanges, including small packets, measured in terms of weight.

Evidence of the strong link between international letter-post traffic and global macroeconomic conditions in the short term is provided below. International letter-post traffic seems to capture particularly well the short-term variations of the global business cycle, in the sense that it can determine the direction of most other macroeconomic indicators before their official release, as we will illustrate. Thanks to its nearly immediate reactivity, international letter-post traffic has great potential to become one of the lead indicators of global economic activity. It repeatedly reacts before other indicators record a deterioration or improvement in macroeconomic conditions.

Granted, some may find it counterintuitive to monitor the short-term evolution of the global economy with a communication medium that is perceived to be in decline. The reality, however, suggests otherwise: billions of letters, reflecting business and financial transactions and direct marketing, are still exchanged between countries. Moreover, the international letter post – made up of cross-border postal items up to 2 kg according to the UPU definition – covers much more than basic letters.

While it is transforming at a fast pace, and fewer letters are carried than a decade ago, the letter post is increasingly transporting heavier documents and merchandise in response to the development of e-commerce and global trade. In a sense, it is moving towards transporting the world economy.

International letter-post volumes have the potential to become a lead indicator of global macroeconomic conditions for two reasons. First, high frequency data on international letter-post volumes can be captured almost instantaneously, in real time, through the exchange of electronic data interchange (EDI) messages between postal operators located in different regions of the world, despite the fact that these systems – as usual with a “big data” approach – were not designed for this purpose.

Second, international letter-post exchanges seem to be highly reactive to changes in global macroeconomic conditions. As a vehicle for international economic exchanges, the Post immediately reflects changing conditions. This is likely due to the nature of international letter-post items, which include small formats like postcards and letters, larger formats like flat documents, and relatively heavy small packages. In a sense, the Post is a proxy for a composite indicator of various sorts of economic transactions, be they financial (bank statements), commercial (trade documents) or mercantile (small packets).

In spite of – or even because of – its heterogeneous composition, the international letter post could well prove a better indicator of the worldwide evolution of business cycles than most international trade statistics. As regards consumer choices, the underlying financial, trade and retail components of international letter-post exchanges, combined with the high frequency of the data available, feed a unique real-time indicator of the pulse of the global economy, namely, the International Letter-Post Weight Index (IPI). By fuelling existing macroeconomic forecasting models, this index could improve the accuracy of forecasts of the evolution of the global business cycle, becoming a leading indicator.

### 3. The IPI as a leading indicator: global vs. regional and BRICS

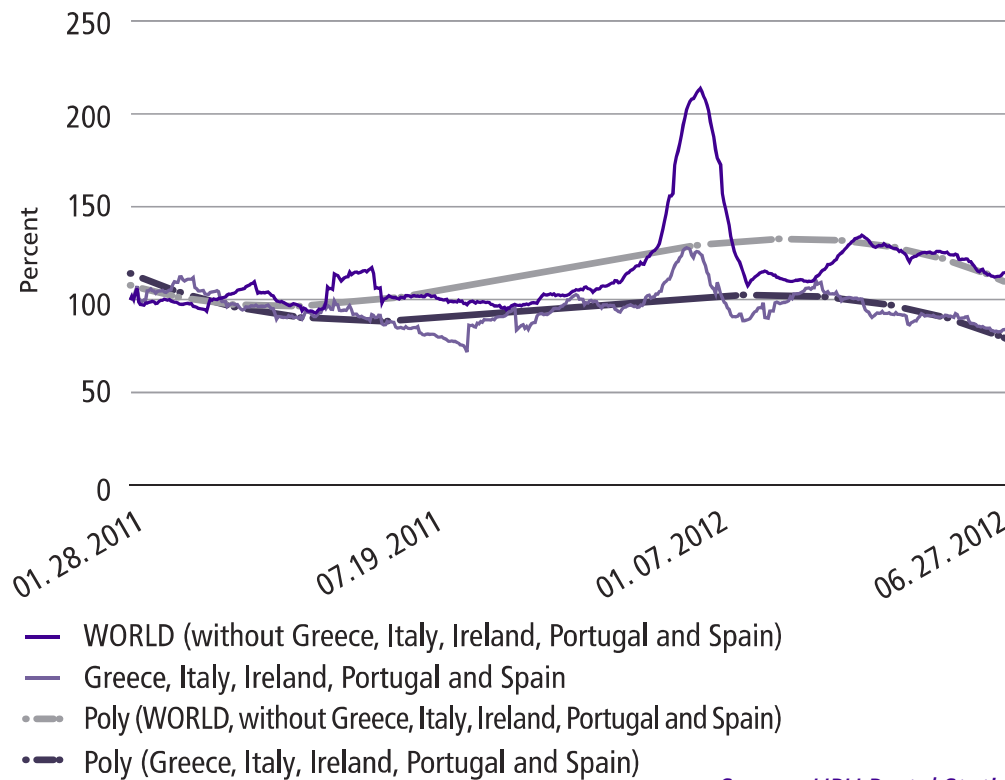
The International Letter-Post Weight Index measures the evolution of the total weight transported by the international letter-post network on a daily basis, starting from January 2011. It is a 28-day moving average of total international mail traffic for items up to 2 kg. The dark blue curve on figure 1 displays the value of this index over an 18-month period (28 January 2011 to 30 June 2012). A smoothed version of the index is also shown to account for seasonal effects and trends.

Starting from a basis of 100 as at 28 January 2011, the IPI reached a value of 108.3 on 30 June 2012, compared with 98.8 on the same day a year before. The peak of 194.3 occurred on 29 December 2011. The smoothed index shows a trough in April 2011 and a peak in February 2012. An apparent link between this international postal trough and peak and the global business cycle is identified below.

Figure 1 also illustrates the ability of the IPI to capture the evolution of various worldwide business cycles. To that end, the evolution of international mail traffic is compared between the group of European countries directly affected by the sovereign debt crisis, i.e. Greece, Italy, Ireland, Portugal and Spain, and the rest of the world. The European index for countries hit by a sovereign debt crisis comprises mail sent from these countries to the rest of the world, mail received from the rest of the world, and mail exchanged between countries in this group. The index for the rest of the world comprises total global traffic, after removing traffic to/from Greece, Italy, Ireland, Portugal and Spain.

The resulting figures, with an index value of 82.9 for Greece, Italy, Ireland, Portugal and Spain, versus 115.4 for the rest of the world (at 30 June 2012), capture well the evolution of the European sovereign debt crisis.

**FIGURE 1**  
**International Letter-Post Weight Index –**  
**World vs. Greece, Italy, Ireland, Portugal and Spain**



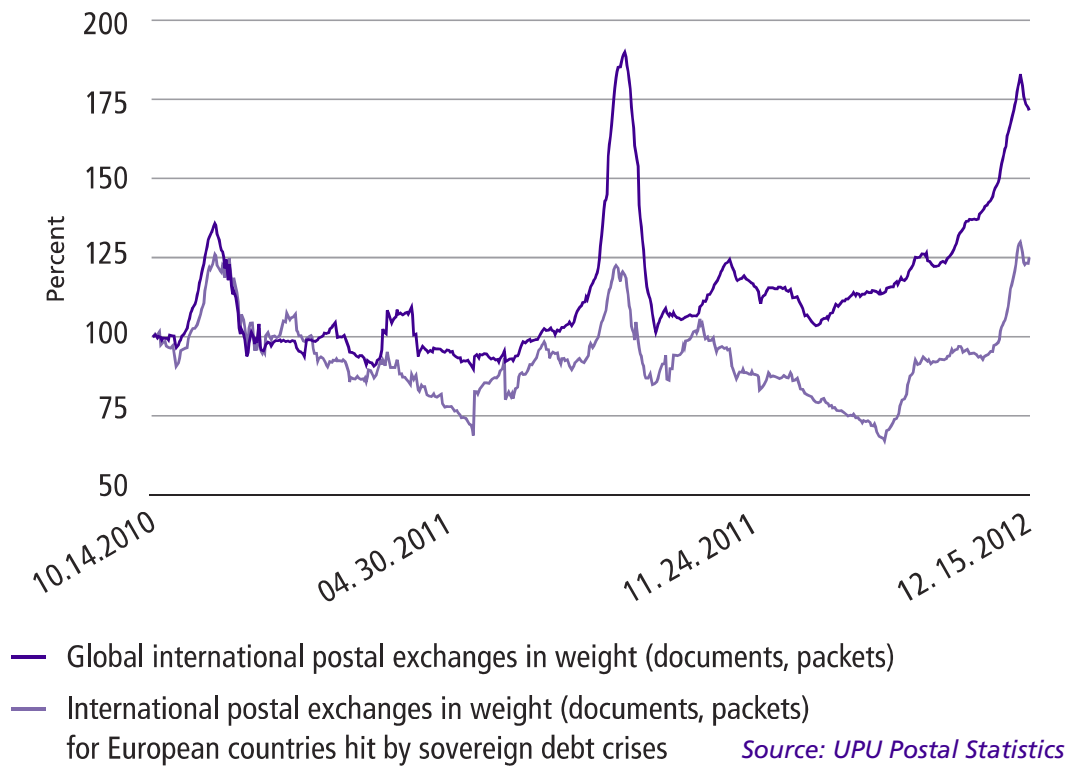
*Source: UPU Postal Statistics*

Moreover, the gap between the two IPIs widens each time the sovereign debt crisis worsens in Europe. This was the case in the spring of 2011 and the spring of 2012. A closer look at the smoothed curves also shows an increase in the gap between Greece, Italy, Ireland, Portugal and Spain, and the rest of the world.

Even more recently, the IPI trough for the sub-set of European countries facing a sovereign debt crisis in 2012 coincided with the intervention of the President of the European Central Bank to reassure financial markets, by stating that the ECB would save the euro “whatever it takes” (see July 2012 in figure 3). Since then, the gap between European countries that were casualties of the European sovereign debt crises and the rest of the world has stopped worsening and has stabilized, as can be noted on the same figure. The year-end peak of these countries was even slightly higher in 2012 than in 2011, although globally the IPI peak was slightly

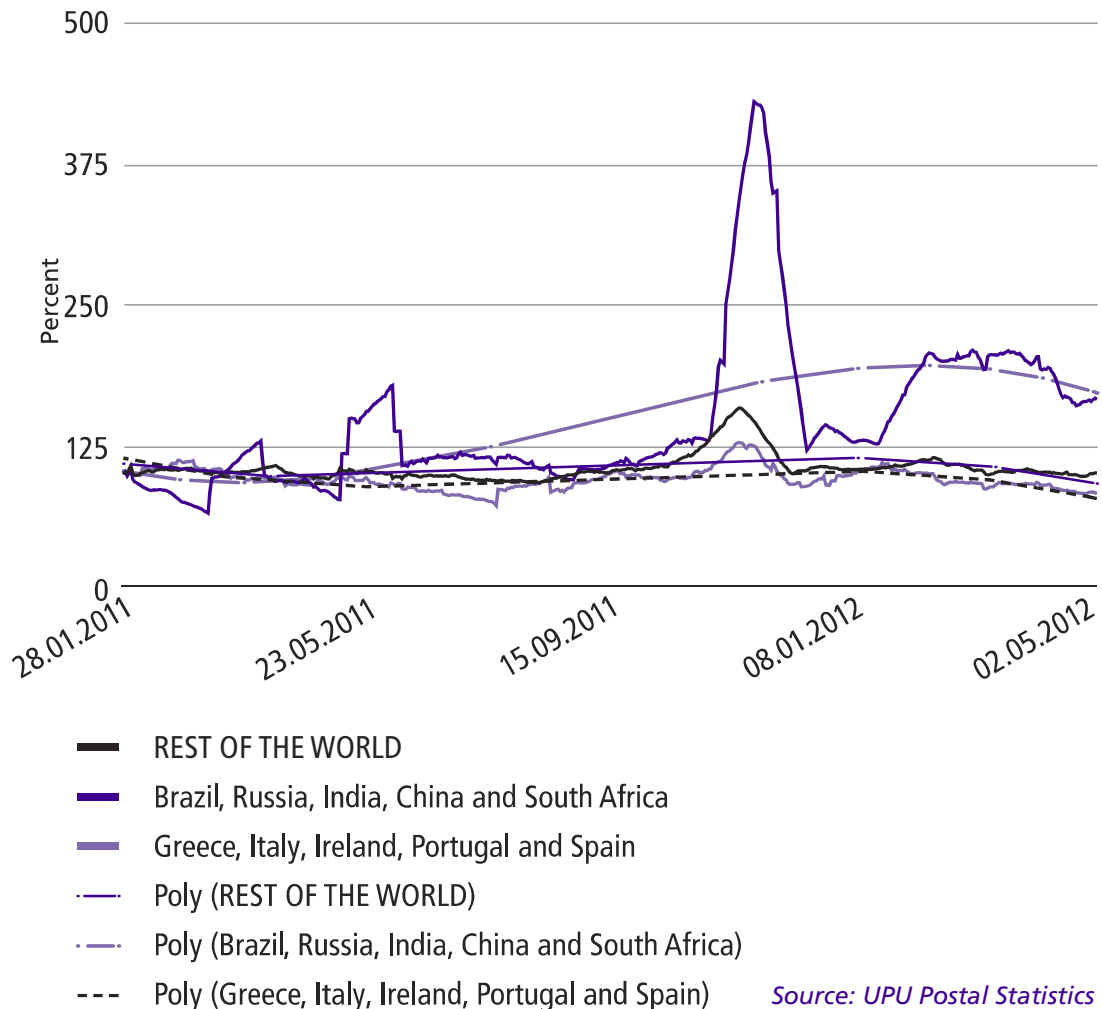
lower than in 2011. This lower 2012 peak shows how the effects of crises can be transmitted from one group to another in a systemic manner.

**FIGURE 2**  
Most recent evolution of the IPI



In contrast to the real-time monitoring of the European sovereign debt crisis, Figure 3 shows the weight of Brazil, Russia, India, China and South Africa (the BRICS countries) in today's development of international trade, and the extent to which BRICS economies now contribute to global economic growth.

**FIGURE 3**  
**International Letter-Post Weight Index –**  
**BRICS vs. rest of the world vs. Greece, Italy, Ireland, Portugal and Spain**



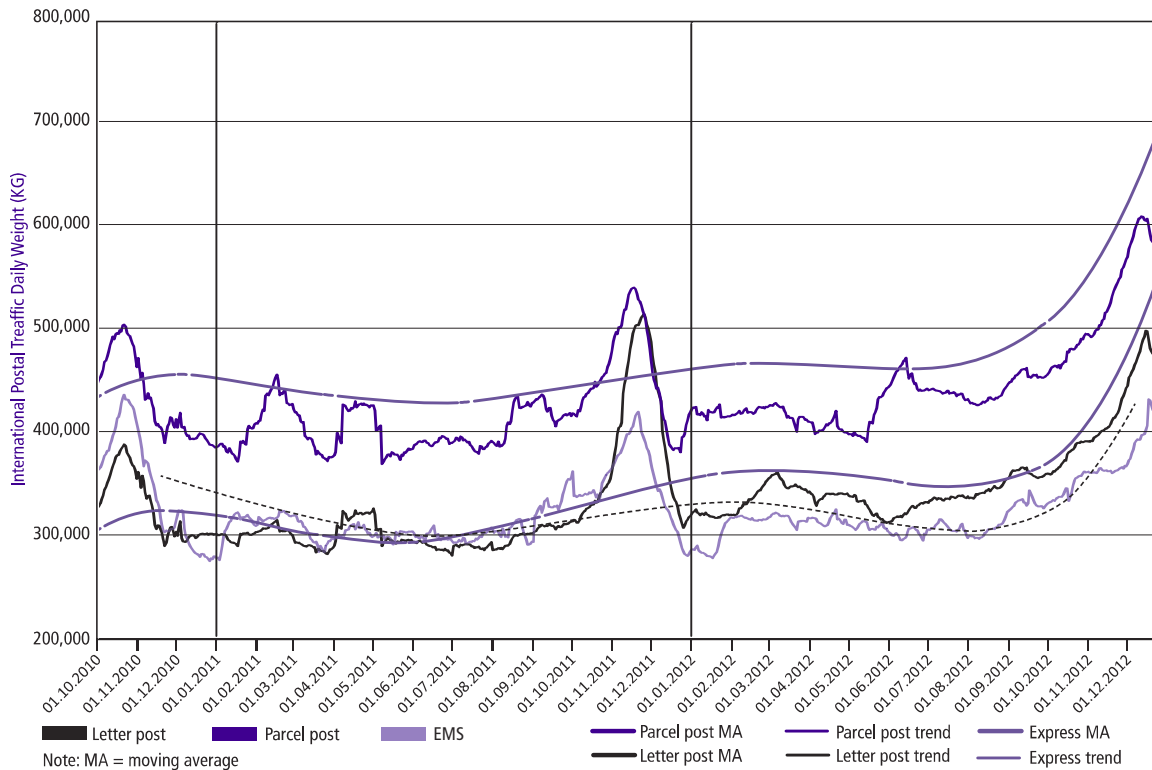
#### 4. The IPI as a leading indicator: extension to parcels and EMS

Figure 4 shows that other segments, such as the parcel post and EMS, follow a similar dynamic pattern in terms of total weight transported through those channels. The stabilization of the high-end EMS segments at similar traffic levels over the last two years also signals a down-trading movement: customers confronted with the global economic and financial crisis prefer lower-end solutions for their cross-border shipments. In the



future, up-trading, that is, the opposite customer movement towards buying high-end services, could signal and anticipate a substantial improvement of global macroeconomic conditions.

**FIGURE 4**  
Evolution of various segments of international postal markets



Source: UPU Postal Statistics

## 5. The IPI and other leading indicators: comparison with Citigroup's Economic Surprise Index

Having illustrated how the IPI captures different business cycle evolutions around the world, we will show how it can increase the forecasting accuracy of most global macroeconomic indicators. Indeed, the IPI can detect in advance whether these forecasts will prove to be pessimistic or optimistic in the coming weeks or months. There are two reasons for this: the IPI seems to be extremely reactive to changes in global business cycle conditions, and its data can be updated every day.

The power of the IPI to detect changing global business conditions can be shown by comparing it with the evolutions of the Citigroup G10 Economic Surprise Index. The Citigroup G10 Economic Surprise Index evaluates ex post the quality of macroeconomic forecasting. If the value of the index is 0, this means that all forecasts for key economic and business cycle indicators in the 10 major world economies were true, and the actual outcome was correctly predicted. An index value above 0 indicates that a majority of forecasts were overly pessimistic about the future global business cycle, while an index value below 0 indicates a majority of overly optimistic forecasts. Figure 5 depicts the Citigroup Economic Surprise Indices since 2006.

The dashed circles along the dashed line in figures 5 and 6 indicate the moment when the Citigroup Economic Surprise Indices reached the value of zero (figure 5), coinciding with the moment when the IPI returned to its initial value in the smoothed version, as can be seen by following the line in figure 6.

In early October 2011, the smoothed IPI signalled an improvement in business cycle conditions, while the Citigroup Economic Surprise Index was recording less optimistic forecasts. In fact, better-than-expected economic performances took the markets by surprise in the following period, and the IPI was able to predict them.

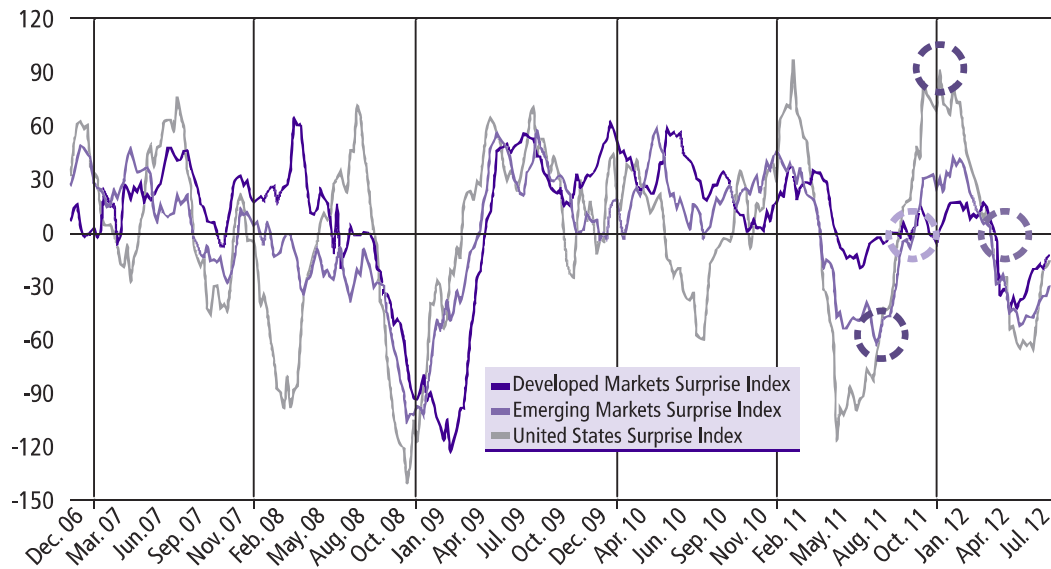
The exact opposite happened in mid-May 2012, when the smoothed IPI signalled a deterioration in global business cycle conditions, while the Citigroup Economic Surprise Index was recording overly optimistic forecasts. Worse-than-expected economic outcomes surprised markets in the following weeks, and the IPI was once again able to predict them.

Moreover, the Economic Surprise Indices and the IPI almost simultaneously bottomed out around May 2011 (see the lowermost dashed circle in figures 5 and 6). Further, they almost simultaneously reached their peak in February 2012 (see the uppermost dashed circle in figures 5 and 6).

The coincidence of the indices' tipping points implies the following: if the economic forecasters used the daily IPI as an input for their forecasts, they would be systematically more correct. The use of international postal data could dramatically reduce the level of error in economic forecasting.

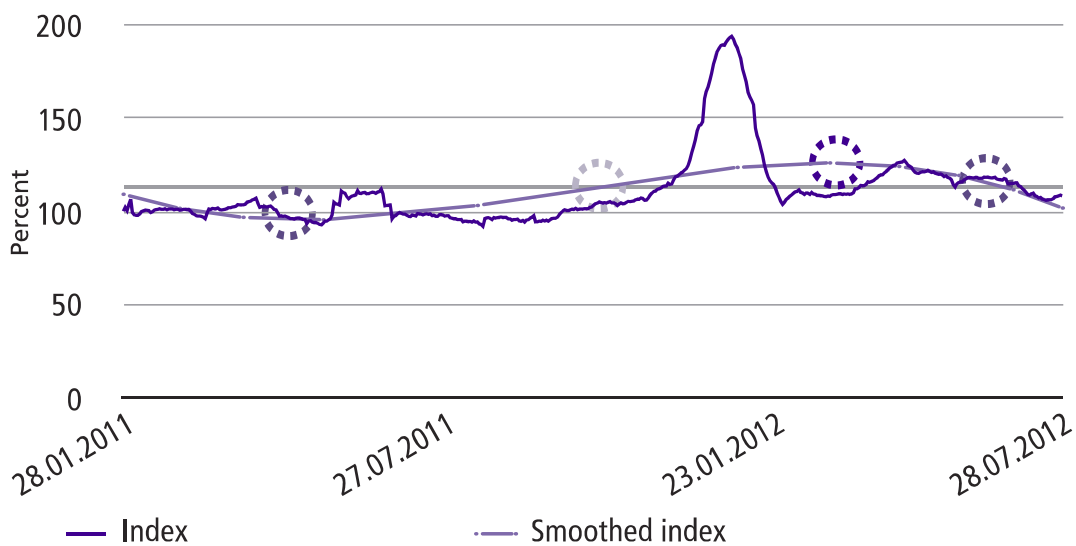
Citigroup Economic Surprise Index curves would then become flatter and, as a corollary, predictions concerning the global economy would become less uncertain.

**FIGURE 5**  
Citigroup Economic Surprise Indices



Source: Citigroup, [theshortsideoflong.blogspot.com](http://theshortsideoflong.blogspot.com)

**FIGURE 6**  
International Letter-Post Weight Index tipping points



Source: UPU Postal Statistics

If applied in the wake of the European debt crisis, the IPIs presented in figure 1 would have identified a clearly worsening trend of the real economy in this group of countries since March 2011. In turn, this would have helped with the production of more realistic forecasts for June 2011, when most forecasters were shown to be overly optimistic by Citigroup Economic Surprise Indices. The same would have held true for the forecasts for November 2011 released in August 2011, when forecasters were overly pessimistic, or forecasts for June 2012 released in March 2012, when forecasters were again overly optimistic.

## 6. Big postal data and sector-specific perspective

From a sector-specific perspective, the use of big postal data could be decisive for the future of the postal sector.<sup>1</sup> EDI messages generate a wealth of real-time data and information that is largely unexploited in the postal arena. Billions of records and scans are left unused in terms of data analytics beyond direct operational purposes. At the international level, billions of EDI records are consolidated by the UPU's Postal Technology Centre but are not leveraged for real-time market or policy analysis. As a result, 99.9% of the global data centrally available at UPU headquarters is not utilized for advanced data analytics purposes, while this wealth of information could play a critical role in the design of tomorrow's postal services and network architecture, and help strengthen the weakest links of the international postal network.

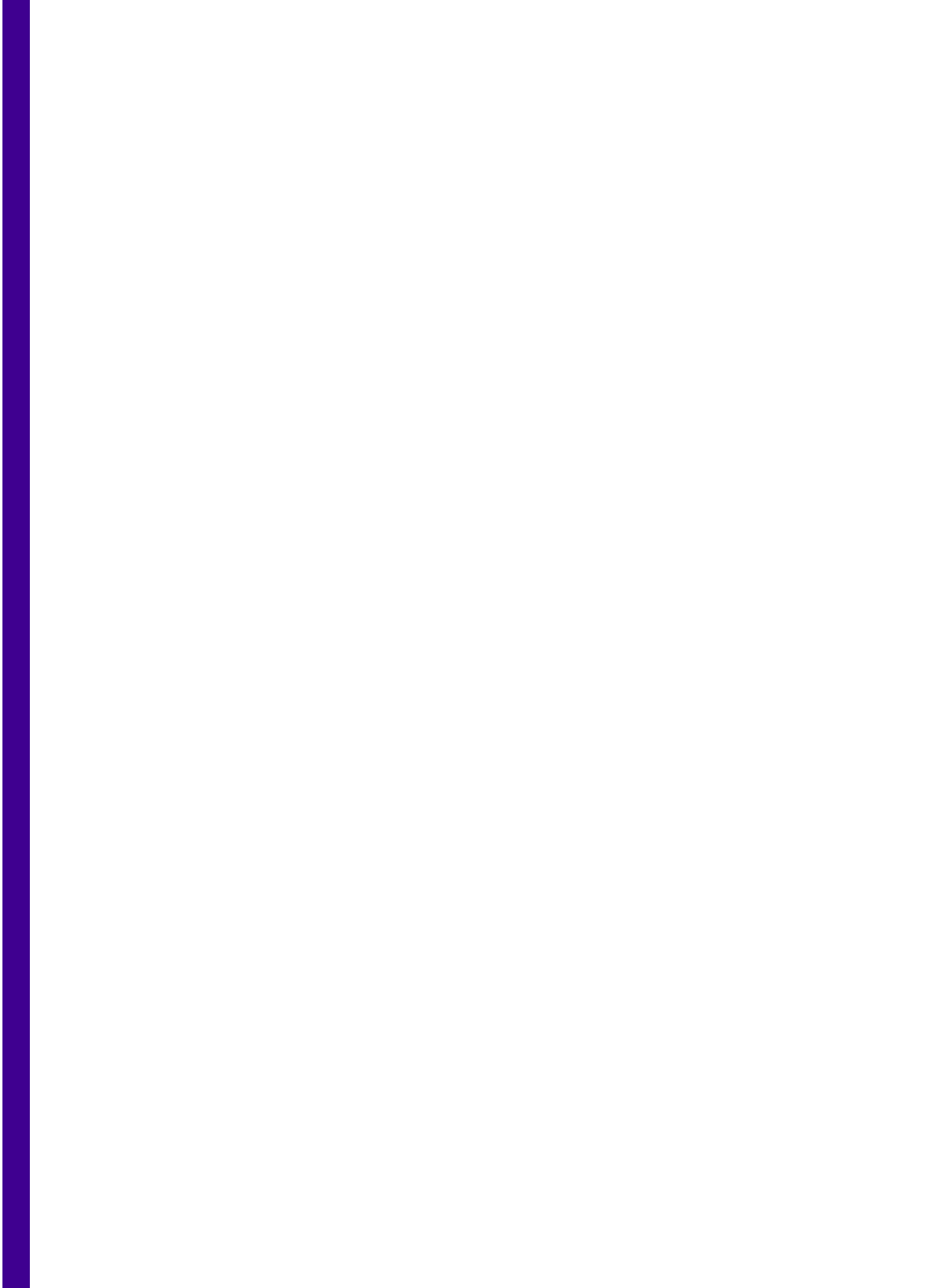
Moreover, this vast source of consolidated real-time data could be potentially leveraged through a web of market intelligence applications, policy evaluation tools and postal economic monitoring systems. The purpose would be to translate real-time data into actionable business and policy insights to support faster fact-based decision making on all UPU bodies. This would facilitate the development of an offer providing a seamless cross-border experience to customers. These tools would all rely on upstream state-of-the-art economic and statistical research. The work would also help identify the most promising development opportunities for the postal sector and support resource mobilization for investment in the postal infrastructure.

## 7. Conclusion

Only time will reveal the relevance of the IPI as a leading indicator of global business cycles. Nevertheless, the observations made above are encouraging. They should incite more economists to take a closer look at the evolution of international mail traffic, through the IPI, in order to limit economic surprises related to their global macroeconomic forecasts. From a research perspective, studying the correlations of these flows with the international trade flows newly available on a monthly basis, yet released with a three-month delay, could also solidify the IPI as a useful global lead indicator available on a daily basis.

In a world dominated by uncertainty, early warning systems are of the utmost importance, not only from a global macroeconomic perspective, but also for postal stakeholders when designing tomorrow's postal services and policies. The postal sector can only benefit from a more extensive use of the huge amounts of data generated through postal exchanges all over the world. The UPU could help postal stakeholders leverage this unique opportunity as they reshape the postal world in the 21st century. As in most modern industries, the way forward for the sustainable development of the postal industry is to unleash the power of its big data.

The last chapter of the book uses big postal data to analyze international postal exchanges, providing more granular insights into what hinders international postal development in the era of global e-commerce.



## CHAPTER 8

### Global postal connectedness

José Ansón and Matthias Helble

#### 1. Introduction

Chapter 7 highlighted the potential of big postal data for business and postal sector policy development, with a focus on its value for the monitoring of global macroeconomic conditions. This chapter makes use of big data again, but this time from a sector-specific perspective, so as to understand the drivers of international postal exchanges and what may still influence their development in a globalized world. International postal connectedness has developed globally, albeit in an imbalanced manner, reflecting a number of factors that make the world less “flat”, in the sense that they hinder cross-border social and economic interactions, than many could have imagined at the beginning of the 21st century. However, with the right set of policies and new innovative services, postal systems could help reduce these obstacles to globalization, and at the same time make globalization truly inclusive for all citizens of the world. Well-targeted reductions in the impeding factors, along with innovation, as the experience of “containerization” of trade has shown (Bernhofen, El-Sahli and Kneller, 2013), could lead to a dramatic expansion in trade surpassing the expansion achieved through WTO-negotiated tariff reductions.

From North America to Asia-Pacific, and from Sub-Saharan Africa to Eastern Europe and Central Asia, there is no region that does not engage in international postal exchanges with the rest of the world. In this sense, postal communication and networks were universal long before the global rise of the Internet and e-mail, or the surge in mobile telephony and new social media. While today’s e-mail and social network interactions are global, the Post is still a medium for written communication, facilitating international trade and e-commerce exchanges every day.

To date, the data on international communication exchanges have been largely anecdotal. For example, there are still no reliable and comprehensive international figures available on the international exchange of e-mail or on international telephony. However, the UPU has recently begun to collect electronic information on daily postal exchanges between more than 150 countries worldwide, resulting in a big postal data cloud containing several billion records. This information was compiled and aggregated into a dataset offering unique insights into the geography of international postal exchanges. After the data was verified and adjusted slightly, all bilateral flows were aggregated at the regional level (seven regions have been defined: Asia-Pacific, Eastern Europe and Central Asia, North Africa and Middle East, North America, South and Central America, Sub-Saharan Africa, and Western Europe). As is often the case with a big data approach, visualization of the data analytics outcomes is key to the facilitation of business and policy making. We thus adopted a mapping approach.

The exercise brought to light some very interesting results concerning postal exchanges between the defined regions. The first observation is that considerable asymmetries exist in international postal exchanges. For instance, for each 20 g letter sent from South America to the Middle East in 2011, 50 such letters were mailed from North Africa to Western Europe.

In turn, for every 50 such letters mailed from North Africa to Western Europe, 12,600 were exchanged among Western European countries. Volumes of international mail communication (e.g. letters, financial statements, periodicals) exchanged between Western European Posts were therefore 10,000 times greater than those in the smallest interregional flows. Even more striking is the fact that Western European intra-regional flows represented almost as much as all interregional flows taken together, even though the population covered by intra-European exchanges is the smallest of all the geographical regions covered in this study.

Western Europe was also the only region that maintained a positive international letter-post balance with other regions in terms of interregional mail exchanges. In 2011, Western Europe sent to all other regions taken together more than twice the volume it received from them. This resulted in negative balances for all other regions, with ratios ranging from 1.5 to 5.3 kg of letters received for every kilogramme sent, except for North



America, which had a more moderate imbalance ratio of 1.1 kg of letters received for each kilogramme sent in interregional exchanges with the rest of the world.

The same imbalances in traffic between regions can be observed for international parcels and express network traffic handled by most incumbent postal operators: once again, two intraregional flows were found to be the largest of all flows, including interregional, although the differences across regions were less acute than in the letter-post segment and there were other sources of imbalance. While Western Europe maintains the lead in terms of cross-border parcels, the Asia-Pacific region is the most developed in terms of EMS (fastest mail service) item flows. North America shows the only clear positive balance with the other regions for parcels, while the same holds true for the Asia-Pacific region in terms of EMS traffic. With respect to parcel corridors, South and Central American flows to North Africa and the Middle East were again at the bottom of the scale. For EMS items, flows from Eastern Europe and Central Asia to Sub-Saharan Africa were the smallest.

The key figures introduced above raise a number of critical questions about the development of international postal exchanges. Above all, this research is aimed at prompting as many insights as possible, in order to understand the factors behind the uneven and asymmetric development, not only in terms of international letter-post traffic between countries, but also in the movement of goods and documents across borders through international parcel and express services. Before we introduce an econometric model identifying the determining factors for these traffic asymmetries, the next section provides an exhaustive description of all interregional and intraregional letter-post, parcel and EMS flows. Three intra- and interregional flow matrices are shown, along with a number of maps giving a better picture of international postal flows between the different regions of the world.

## 2. The economic geography of international postal exchanges

### 2.1 International letter post

The description and analysis of intra- and interregional postal traffic flows are based on the following seven geographical regions: i) Asia-Pacific, ii) Eastern Europe and Central Asia, iii) North Africa and the

Middle East, iv) North America, v) South and Central America and Caribbean, vi) Sub-Saharan Africa, and vii) Western Europe (see figure 1).

**FIGURE 1**

Intra- and interregional flows analysis: geographical definition of regions

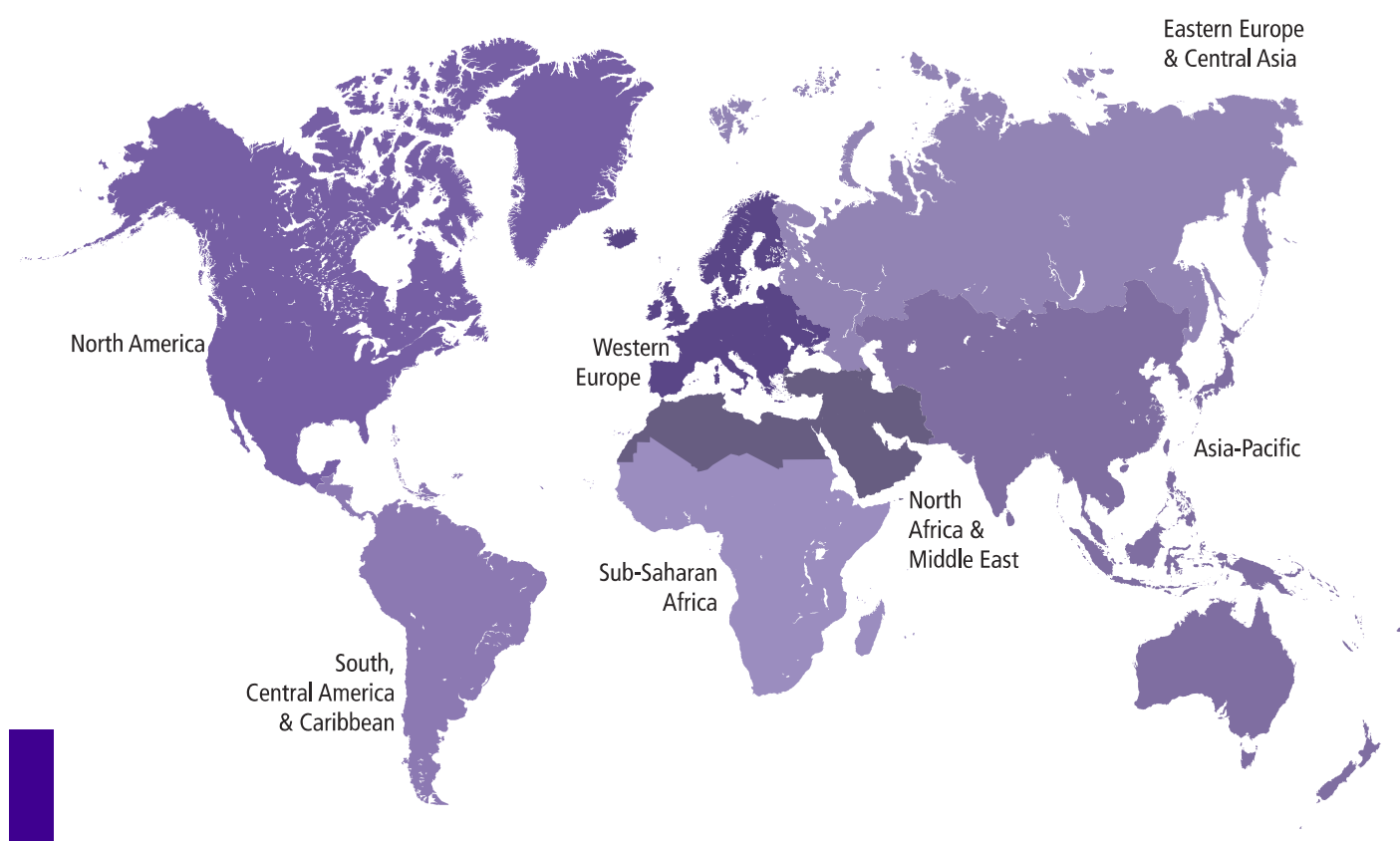


Table 1 below represents a full matrix of intra- and interregional letter-post traffic flows. The first column lists the regions of origin, or export, while the first row lists the regions of destination, or import. In order to build this table, data on international mail exchanges was gathered from EDI messages exchanged between postal operators during the period 1 January to 31 December 2011. In cases of missing data, estimates were made using the econometric model that will be introduced in the next section.

**TABLE 1**  
**International letter post: intra- and interregional relative flows (per kg at the median flow – 2011)**

Origin/Destination	Top 10		Bottom 10						Total rel. interregional (dispatch)
	Asia-Pacific	Eastern Europe & Central Asia	North Africa & Middle East	North America	South, Central America & Caribbean	Sub-Saharan Africa	Western Europe		
Asia-Pacific	30	3	0,595	18	2	1,5	15	40	
Eastern Europe & Central Asia	2	3	0,16	2	0,354	0,185	16	21	
North Africa & Middle East	0,259	0,116	0,023	0,231	0,047	0,032	1 kg	1,7	
North America	27	3	0,656	25	7	2	31	71	
South, Central America & Caribbean	0,625	0,093	0,02	1,5	0,495	0,072	0,982	3,3	
Sub-Saharan Africa	0,609	0,076	0,02	0,617	0,116	0,192	0,936	2,4	
Western Europe	29	35	4	55	8	6	252	137	
<b>TOTAL REL. INTERREGIONAL (receipt)</b>	<b>59</b>	<b>41</b>	<b>5,5</b>	<b>77</b>	<b>17,5</b>	<b>9,8</b>	<b>65</b>	<b>275</b>	

Note: The median flow (1 kg) is between the North Africa and Middle East region and the Western Europe region.

To make the table as readable as possible, we have listed all mail flows in relation to the median flow. In other words, all mail flows are measured in numbers of kilogrammes for each kilogramme of international letter post exchanged at the median flow level. The values indicated in table 1 therefore represent measurements of the relative size of each intra- or interregional flow. With the exception of the last row and column, the boxes where the origin and destination region are the same show the relative volumes of intraregional mail between countries within one region. No domestic mail exchanges are included in the figures. The top 10 flows in volume are highlighted in grey, and the bottom 10 are shown in lavender.

The median flow is represented by the international letter post sent from the North Africa and Middle East region to Western Europe. Half of all regional flows are lower in volume than this flow, while the other half are higher. As indicated above, the median flow constitutes the basis of